American Machinist

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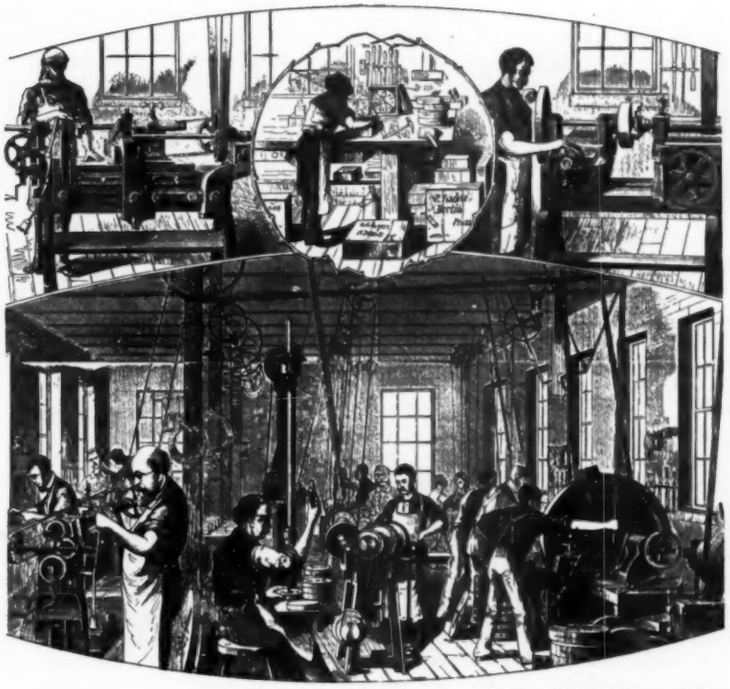
# FIFTY YEARS A SCRIBE

FRED H. COLVIN
*Editor*



*Shop of E. Horton & Son Co. chuck makers—1851*

**On the anniversary of the acceptance of his first contribution to "American Machinist," fifty years ago, Fred Colvin lets his mind run back over what has happened to the machine shop and its products during that important period of American history. This is the first of a short series of reminiscences by Mr. Colvin that will appear regularly in "American Machinist"**

FIFTY years ago, in the issue of April 3, 1886, *American Machinist* published my first writings on machine shop practice, while I was still an apprentice in a small shop in Philadelphia. Almost unbelievable changes have taken place in the industry—in all industry—since that time. The magnitude of the changes can perhaps be typified by a reference to the old shop itself.

It was a three-story building where about 50 men worked on engine lathes, Fox lathes, a few hand turret lathes, a planer, an old miller and a few drill presses. Each floor had its lineshaft with a complement of pulleys and belts running to countershafts over the machines themselves. The lineshafts were driven by vertical belts from an engine in the cellar and from floor to floor. What percentage of the initial power reached the machines I have no idea, but the Corliss engine that drove the whole shop was only 25 hp. We now put a motor of that size on a single 24-in. lathe and from 75 to 100 hp. on some large machine tools. This change in power is typical of many other changes that have taken place. We had, however, the beginning of many of our present-day developments, some of which it seems advisable to recall, without any attempt at their relative importance or chronological order. And they are confined to tools used in our own shop.

Horton was already milling screw threads for chuck screws; Whiton made centering machines even if few shops availed themselves of them; Westcott, Morse and Almond made good drill chucks; John Grant was advocating the use of the miller for many surfaces then being planed (although he never would have done so if his experience had been confined to our milling machine); and many other changes were in the making. Oscar Beale, George Grant, Hugo Bilgram

and William Gleason were striving to educate us all to the need for better gears, and W. S. Davenport was developing the automatic screw machine. William Sellers, William Bement and the Putnams of Fitchburg were building heavy machine tools, largely for railway work.

Brown & Sharpe and Pratt & Whitney were developing lines of smaller machines, gages and small tools, Morse and Cleveland were making twist drills, and the New Process Company in Taunton, Mass., had started to twist drills from flat bars. The old Farmer, or straight-fluted drill, was also in use.

I have made no attempt to give these developments in chronological order nor to include them all, only what stand out in my recollection of the times.

## No High-Speed Steel

Fifty years ago nearly all tools were made of carbon steel, known as tool steel or cast steel, because steel castings were a later development. Some of the best steels came from England, such as Jessop's and Sanderson's. We forged and tempered our own tools to a large extent. But even then we had toolholders, some bought and some made in the shop, which used standard sizes of bar steel and saved forging. A special threading tool was one of my choice possessions. It was ground to the proper angle and had serrations on the back side to adjust its height and hold it against slipping. It was made by either Pratt & Whitney or Billings & Spencer, I am not sure which.

Mushet air-hardening steel was beginning to be appreciated and on its heels came the Taylor-White experiments. We also had a spell where tools were made of cast iron with the cutting portion cast in a chill. Some of these cut surprisingly well at the speeds and feeds of those days, but their use was sporadic and never general. The same may be said of the use of low carbon steel tools with the cutting edges carburized, or case-hardened as we always called it. Some claimed great economy in the use of these tools, and there were spasms of recurrence, especially in milling cutters for railway work, lasting over quite a period of years. It was evidently one of the many false economies that appear from time to time.

Carbon tools were the rule in most shops, and cutting speeds of from 15 to 30 ft. were considered good practice. While carbon steel still finds a place, high-speed steels have become standard, with Stellite and cemented carbides making a place for themselves much more rapidly than did the high-speed steels in the early days.

Nor have the changes in materials to be cut been less startling. Bessemer steel and what we called "machine steel" vied with each other in popularity, while "good wrought iron" still held a high place, especially for forgings. It was very fibrous and was more or less seamy from included cinders which rolled out into the bars. It cut very easily but the cinder grit was a bit hard on carbon tools. Bessemer steel soon found a place for itself. We also had cold-rolled bars, and drawn steel was beginning to make its way, while Cumberland ground shafting was something of a mystery to the average shop man. Drill rod was available and used considerably.

Cast iron was low in tensile strength and it was not commonly alloyed as at present. Steel castings were making their bid for popularity but were usually under suspicion as to soundness. Blow holes were uncovered by machining, with disconcerting regularity, and we had no flame welding to salvage the castings. Their present high standing represents a real achievement. I have recently seen castings for machine tool beds that were a revelation both as to the percentage of steel in the mixture and the closeness of grain as indicated by the planed surface.

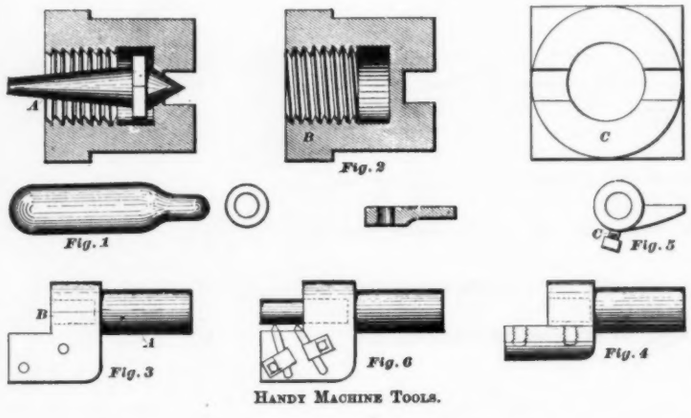
**LETTERS FROM PRACTICAL MEN.**

**Some Handy Shop Tools.**

*Editor American Machinist:*

I send you herewith a few kinks which are in daily use by me in course of my ordinary shop practice. Fig. 1, I call my riveting block, which is merely a piece of round cast-iron smaller at one end than at the other. I clamp it in the vise (it is six inches long) so that it projects far enough above the jaws to be convenient. I find that it makes a very useful tool for riveting. Sometimes I use one end and sometimes the other as the work requires.

Figs. 3, 4, 5 and 6 show a milling tool for use on turret lathes. It is a casting whose general shape can best be had from Figs. 3, 4 and 5, giving top, side and end views. A hole is bored in the center *B*, the shank a chuck; bored out to admit lathe center through it, and a little longer, say $\frac{1}{4}$-inch, than the distance from the shoulder of spindle to the point of center, with the slot across the center, as shown at *C*. The slots want to be deep enough to admit of movement of steel when turning taper reamers. I like it very well for such work, and hope I have made it clear.




HANDY MACHINE TOOLS.

Fig. 2 represents my chuck, dog, or carrier—latter name, perhaps, is the best—for flat cutters, reamers, etc. I use it mostly for turning flat reamers to a taper. *A* is intended to show it in place over the lathe spindle with center in, although I have not succeeded as well as I could wish with it in that position.

You will readily see that with the flat steel center *A*, placed in the slot across the face of the carrier, it drives from both sides. *B* is the section of carrier; *C* is the end view. In plain words, it is a cast iron carrier; round, save a square at the rear end to take off of the lathe width. It is fitted to the lathe same as having been turned to fit the turret. *B* is bored to receive the centering cutter, which keeps working through while the milling is being done; the cutter is held by set screw *C*, Fig. 5. Fig. 6 gives a general idea of the use of this tool, showing cutters in place. The milling cutters are merely flat pieces of steel held in place by clips, shown above, Fig. 6, offsetting the depth, or rather a little less than thickness of cutters. These clips are held by screws, as shown in Fig. 6. They are cheap and admit a large arrangement of adjustment. Center cutter can, of course, be made of any size. They are not patented.

FRED COLVIN.

*Fred H. Colvin's first contribution to American Machinist*

Non-ferrous metals and plastics have given us an entirely new line of materials for our products. Early advocates of aluminum, or aluminium as we first called it, made claims that could not be borne out in practice. Its lightness was amazing, but its strength bore a close resemblance to that of a piece of custard pie. And now look at it and its alloys, not forgetting its rival, magnesium.

In non-metallic lines we were confined to using rawhide, hard rubber and fiber for quiet gears. Both rawhide and fiber were susceptible to moisture, and hard rubber was too brittle for most gears. Dimensions varied perceptibly with both moisture and temperature. The fiber changed shape in a most disconcerting manner, especially when we wanted a flat surface. Hard rubber was used largely when we began to play with electricity in the shop, but it was costly. We had a pattern maker who spent all his spare time and money building an illuminated advertising sign that had six automatic changes. It worked very well in a more or less crude fashion, but he never got his money back. I've often thought I would like to have him see some of the huge signs that now decorate, or mar, the great white way in many large cities.

## Changes in Equipment

Startling changes have taken place in nearly all machine shop equipment. The modern all-geared lathe is a far cry from the 4- or 5-step cone, 16-in. lathe driven by a 2-in. belt. The turret lathes, semi-automatic and full automatic, have attained a perfection that would have seemed unbelievable then. Drilling machinery has changed greatly. Milling machines have been developed from the knee and Lincoln types into more forms than we imagined possible. The grinding machine has made a spectacular advance in many ways. From the small machine which made more sparks than anything else, it has grown to a real production machine both in removing metal and in imparting finishes that are more accurate than we ever dreamed of. Boring, gear cutting and broaching machines have likewise made startling advances

Methods, too, have changed as much as machines, many of the changes being caused by the phenomenal growth of the automotive industry. It has been my privilege to watch this development rather closely, beginning with the old curved dash Oldsmobile in Detroit and the Packard when it was a one-lunger, built in Warren, Ohio. The old Ford plant on Piquette Ave. in Detroit, the Acme in Reading, Pa., the Stanley Bros steam car shop and others were visited in their day. The influence of this industry on all manufacturing, as well as on machine tools, has been most interesting, especially the greatly improved quality of product that is now available, even in the lower priced cars.

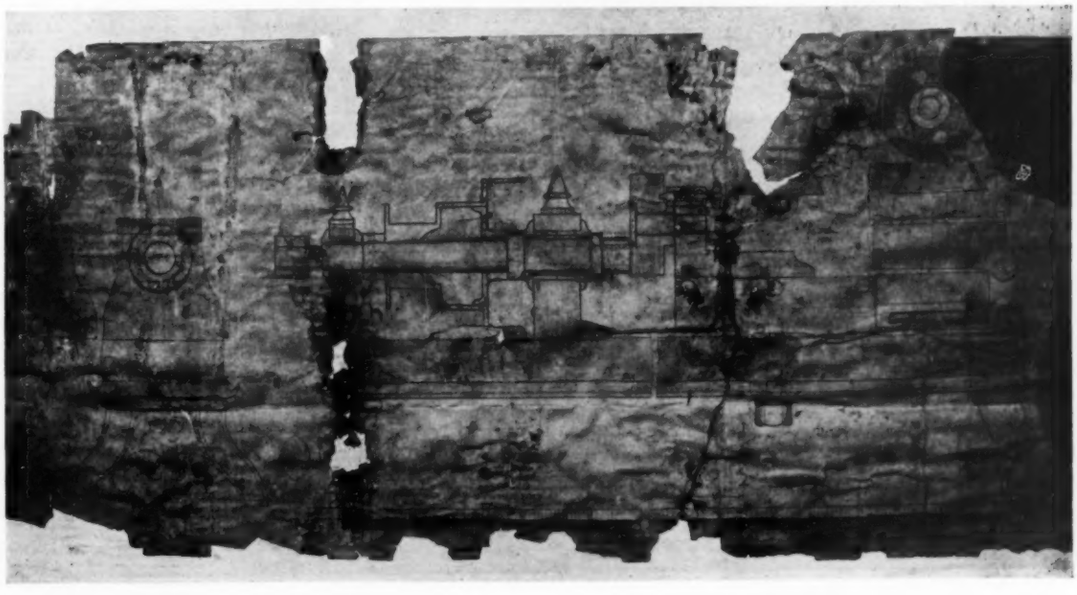
Among the pioneers in this struggle for greater accuracy in automobile parts was my good friend Henry Leland, first with Cadillac, then the Liberty engine and the Lincoln car. He was a leader in the efforts to secure closer tolerance on all fits, including screw threads for connecting rod bolts. And there were many others who built cars that were good in their day but are now but memories.

## Built Motors First

Henry Leland got into the automobile game through building motors for the old Cadillacs. One of his early demonstrations was the disassembly of three cars, the parts being piled on the floor. Then three cars were assembled, taking parts as they came. It was a striking stunt, even though the tolerances were not as close as they are today. With Henry Leland for many years was my old friend and shopmate, George Lange, who worked with me in Worcester in 1892 and '93.

I also knew Harry Knox, with his porcupine air-cooled engine in his three-wheeled car, and Charles Duryea, the advocate of the high wheel, buggy-type car with the single control that resembled the joy-stick of the small airplane of today. W. S. Rogers, best known in connection with the Bantam Ball Bearing Co., at one time built a steam car in Keene, N. H. Rogers was one of the early advocates of the Halsey premium system. Alexander Winton also left his mark on the automobile. He pioneered the big car in the early days and put on the first starter I ever saw, not electric, but compressed gas.

*Drawing of an early turret lathe dated 1856*



# DIGGING OUT

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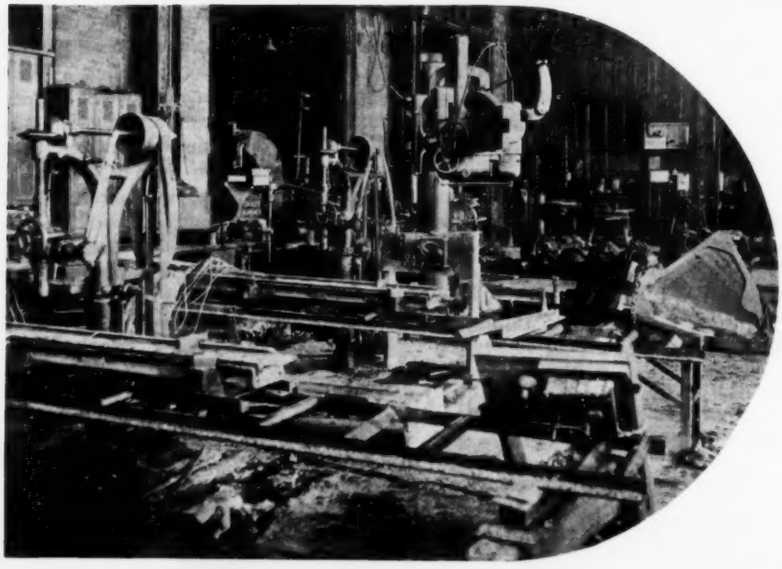
## Mechanics turn to Salvaging



• *Above—Emergency bulkheads were built into doors and windows of Westinghouse Air Brake plant; machinery was moved to upper floors; second-floor power plant was hooked to Duquesne Light lines to supply hospitals and P. R. R. signals*

• *Left—Corner in H. K. Porter locomotive plant improvised for reconditioning shop for equipment damaged by flood. Note motors in background ready for final inspection. (Exclusive* AMERICAN MACHINIST *photo.)*

• *Below — Scrubbing small motor parts in naphtha is shown at left, and preliminary cleaning was done with a high-pressure fire hose, right, at the Westinghouse Electric & Mfg. Co. (Westinghouse photos.)*

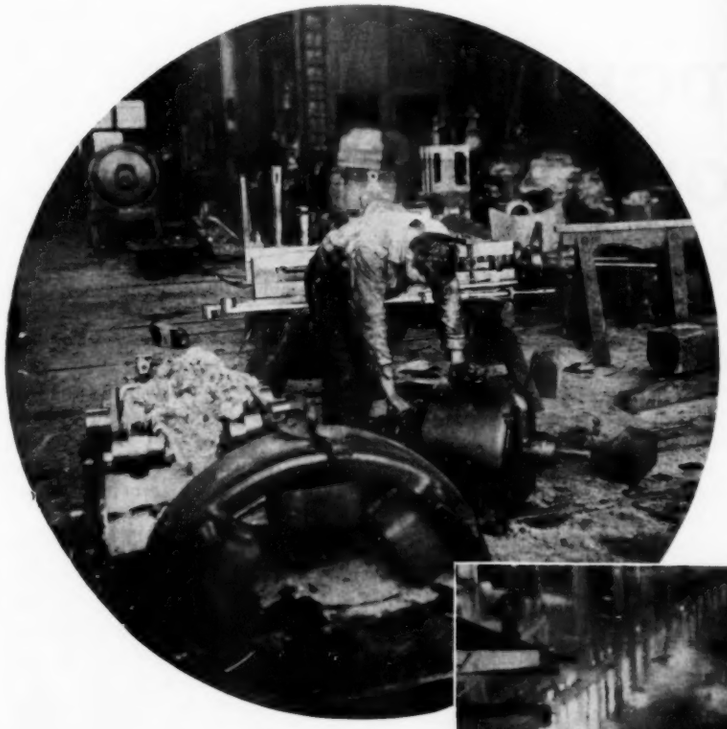
HEROIC DEEDS have been headlined in newspapers reporting the devastation of one of the worst floods in the history of the Eastern states, but our own editors and friends have written and wired us about the herculean task of getting plants in operation again.

Tons of muck and silt had to be shoveled out, buildings repaired and machinery cleaned before wheels could start turning again in those plants situated in the lower levels of flooded valleys. Delicate electrical instruments and machinery presented a major problem. Parts had to be taken down, cleaned, dried and polished. Mirror-finish bearings and working surfaces had to be replaced or reground and polished. Rust and corrosion damaged a great deal of finished products. Yet, little delay was experienced in getting factories back into production.

Latest estimates indicate that factories suffered damage to the extent of about $32,500,000 because of the floods. Story on page 308e.

• *Above—Machinist standing in a foot of water on the second floor of Colt Patent Firearms Mfg. Co., Hartford. Water was 15 in. above this at peak*

• *Below—Terry Steam Turbine Co. plant, Hartford, flooded up to lathe centers, damaging hundreds of machines, tools and finished turbine parts which had to be refinished*



• *Above — Cleaning motors and generators after the flood required special care. Machinist in the Porter locomotive plant tearing down a motor, which was first washed and scrubbed, to remove moving parts and coils for polishing and drying. Coils were slowly dried in ovens and tested before replacing. (Exclusive* AMERICAN MACHINIST *photo.)*

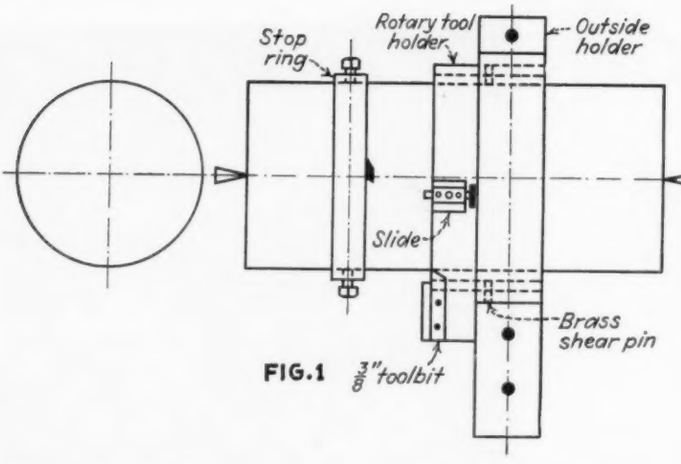



FIG. 1

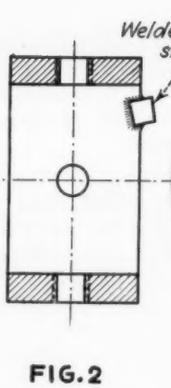



FIG. 2

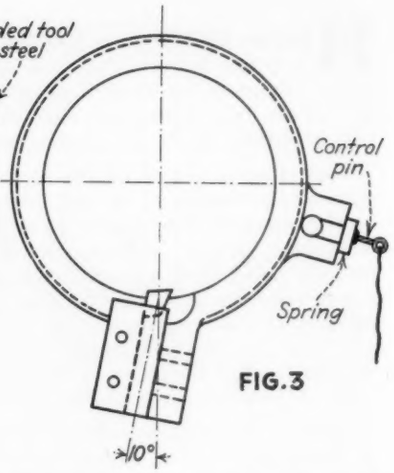



FIG. 3

*Fig. 1—Top view of "rotary toolholder" set-up; by means of this arrangement the dynamic conditions of cutting can be studied because the chip is undamaged when a sample is taken*

*Fig. 2—The stationary stop ring has a tooth that catches the spring-actuated stop pin in Fig. 3 when the pin is released. This contact shears the brass pins causing the rotary toolholder to revolve with the work until the lathe is stopped*

# BUILT-UP EDGE on the SINGLE-POINT TOOL

VASILY D. PRIANISHNIKOFF

STUDIES of chip formation present many problems that offer fascinating avenues of solution and practical contributions to our knowledge of machinability when they are solved; few of these problems are so little unexplored and so suggestive of results as that presented by the built-up edge phenomenon. Even at the present moment, the necessary scientific background is comparatively undeveloped. The researches of Sawin[1] and Rosenhain[2] in the early years of the century did little more than to present a few illustrations and lead to a sketchy description of this phenomenon as a sidelight to a study of the structure of materials under mechanical stress. Later studies, beginning with that of Herbert in 1926[3], while reflecting improvements in the experimental technique of machinability and leading to a more scientific recognition of the phenomenon and its importance, still treat the built-up edge only as it bears upon their results in a larger field. It is only recently that a satisfactory definition of the built-up edge has been attained.

It has been my good fortune to devote two full years to the study of the built-up edge. I have investigated it through an original method, and with apparatus invented solely for the purpose. It has been possible to isolate the phenomenon as it actually exists under various cutting conditions; to take microscopic photographs of its various states under these conditions, and to determine the relative size of these states, not only in two, but in three dimensions.

First of all, it is necessary for the proper interpretation of these results to sketch lightly some of the theories concerning the built-up edge that have hitherto held the field. Herbert in his pioneer work was the first to describe the built-up edge as the actual cutting implement present when obtuse-angled tools are used on ductile metals. O. W. Boston[4] more recently described it along similar lines, but with greater accuracy:

> **It appears that, when a tool starts to cut, the material immediately ahead of the tool point bearing on the face of the tool is trapped and compressed against the face of the tool by a force which, acting at an elevated temperature, causes it to remain in that location. This material then becomes the built-up edge which is forced into that being cut as the tool advances and appears to be the actual medium for separating the chip from the balance of the metal.**

Finally, Ernst and Martellotti[5] have carried the descriptive definition a little further:

> **In all studies of chip-flow, one of the most outstanding facts observed is that there exists, under certain conditions, a relatively stationary wedge-shaped body of material which precedes the nose of the tool, and appears to cling thereto, while the main body of the chip flows over it.**

My own definition of the built-up edge will be found in substantial agreement with these opinions, although stressing the process from a different angle. The built-up edge is the cutting implement which forms on the extreme edge of the face of the tool, but it consists essentially of plastically deformed particles of the material being cut, and these particles are strained

[1]N. N. Sawin, *Uber den Schneidwiderstand der Metalle beim Hobeln und Drehen*, Leipzig, 1909.
[2]Walter Rosenhain, "Crystalline and Amorphous Metals," *Engineering*, 1913, pages 370, 509, 537. Translated in *International Zeitschrift Metallographie*, Vol. V, 1914.
[3]E. Herbert, "Work Hardening Properties of Metals," A.S.M.E. *Transactions*, Vol. 48, page 705.
[4]O. W. Boston, *Engineering Shop Practice*, John Wiley & Son, New York, 1933, Vol. I, page 116.
[5]Hans Ernst and M. Martellotti, "Metal Cutting: The Formation and Function of the 'Built-up' Edge," *Mechanical Engineering*, August, 1935, Vol. 58, No. 8.

and "set." To elucidate the definition further, we need a short excursus into the theory of plasticity.

When metal is being cut by a tool, the action of the cutting edge depends on the production of myriad stresses over a very small area at a time. These stresses are sufficiently severe to produce plastic flow and local failure of the material. Now, in the material used for my experiments, mild and alloy steel, the mechanism of such flow seems to follow the first law of plastic deformation[6]; that is, the law of "slip" or parallel displacement of the elements of a crystal lattice. Applying these facts, we immediately obtain an illuminating explanation of the mechanism for direct flow and hardening which underlie the phenomenon of the built-up edge.

During chip formation, the sliding over each other of the adjacent slip surfaces naturally produces a local disturbance in the molecular structure of the material much in the same way as rubbing or polishing produces a thin layer of altered amorphous material (work-hardening).

If the disturbance is far-reaching, the molecules will no longer be able to rearrange themselves into the previous crystalline system. Consequently, a more or less appreciable layer of amorphous metal will be formed on each slip surface. For a short time these layers undoubtedly possess a certain degree of mobility, and act as a lubricant to facilitate further slip along the same gliding planes. Very soon, however, when the disturbed molecules have had time to "set" into the amorphous condition, there appears in each place where slip has taken place a layer of hard, non-plastic, amorphous metal—the built-up edge.

Its behavior is obviously conditioned by the continuation of the forces that caused it. As soon as the layer of hard, non-plastic, amorphous metal is formed, it will prevent any further slip along that particular set of gliding planes. Moreover, since the surface of the *easiest* slip is the one used at the first straining of the material, it follows that more force will be required to effect plastic deformation of the material in the second straining than in the first. This is particularly true because the hard and brittle amorphous films on the surfaces of the previous slip will act as a stiffening skeleton for the whole crystal. Here then is a simple explanation of the built-up edge, and one which will account for the fact that in spite of being of the same material as that which is cut, the built-up edge can endure and perform the cutting action.

Both this theory, and the practical experimental results upon which it is based, were dependent on the discovery of a correct type of experimental set-up. Its evolution was a matter of some difficulty.

The basic problem was to transfer the dynamic state of actual cutting conditions into a state of immobility. This had to be done in such a manner that the chip would be uninjured, would preserve intact its development at the precise moment of transfer, and would be available for microscopic study. Moreover, the apparatus had necessarily to duplicate cutting conditions commonly encountered in a modern shop. This apparatus finally took the form of the so-called "rotary toolholder."

The construction of this toolholder was quite simple. It consisted of three main parts: (*a*) the outside holder, (*b*) the rotary part to revolve with the tool, and (*c*) the stop ring. The location of these parts in the complete assembly was as shown in Fig. 1. The stop ring was located at a definite distance to the left of the cutting tool supported in the rotary toolholder. The rotary toolholder was inserted in a rigid, stationary outside-holder

[6]A. Nadai, *Plasticity*, McGraw-Hill Publishing Company, New York, 1931, page 30.

**A knowledge of the work-hardening action at the cutting point will help prolong tool life and obtain a smoother finish**

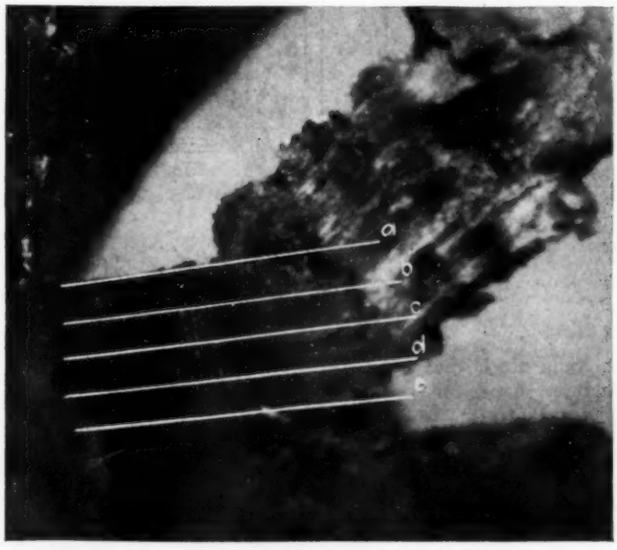



*Fig. 4—View of a chip with a built-up edge on it; the direction of the sections at which the built-up edge conformation was studied is shown by the five lines*

*Fig. 5—Micro picture of the built-up edge for sample A at the outside surface of the chip. Magnification approximately 9.5 times, cutting speed, 34.5 ft. per min.*

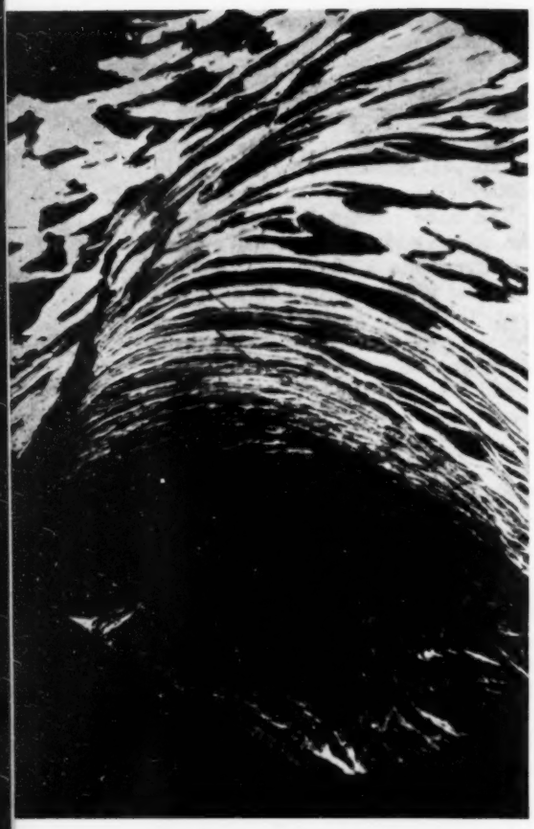


*Fig. 6—Micro picture of the built-up edge for sample* A *at the outside surface, but at a magnification of approximately 70 times. Cutting speed, 34.5 ft. per min.*

which performed two functions: first by means of shear pins it held the rotary toolholder stationary during cutting; and second, it acted as a bushing for the rotary toolholder after the pins had been sheared and before the lathe was stopped.

The machine tool used was a Monarch engine lathe, 14 in. by 6 ft., with variable-speed electric motor. The cutting tools were of Motung high-speed steel; $\frac{3}{8}$ x $\frac{3}{8}$ in. toolbits were used for all tests. Since I was particularly interested in studying the influence of the different cutting conditions upon the built-up edge formation, I took as variables cutting speed, feed, depth, ductile materials, tool shape, and cutting fluid. By making one of these cutting conditions variable and keeping the other five constant, I was able to determine the fluctuations in the built-up edge resulting from the influence of any one factor.

With this apparatus I was able to adopt a standard experimental technique with comparatively few variations. A steel piece was turned and finished to a 3-in. log, and then cut with annular grooves at equal intervals. The rotary toolholder was set so that the axis of the holder and the axis of the work were in the same horizontal plane during cutting. Cutting then took place in the conventional manner. When, however, the cutting tool approached the rear end of the test ring, the control pin, Fig. 3, was pulled out of its locking position, with the result that the spring-controlled stop pin moved forward instantly and struck the tooth of the stop ring, Fig. 2, shearing the brass pins, Fig. 1, and allowing the aluminum toolholder to rotate freely with the work. The lathe was immediately stopped at this point.

The toolholder was then removed to permit removal of the work material with its sample. The specimen was sawed off and mounted with the aid of Wood's metal in a cup. The outside surface was ground and polished in the usual metallographic manner and etched with 5 per cent nital solution. In order to obtain the third dimension of each sample, I prepared, in the same manner, four sections lying parallel to the first one, Fig. 4. Finally, photo-micrographs and diagrammatic sketches of every section were taken by means of an optical scale tube. Since the graphical method of recording all data proved to be the most objective and accurate, it was used for recording each sample.

To cover the full range of cutting conditions, about 50 samples were prepared, of which two with their micrographs and corresponding diagrams for two representative cutting speeds are illustrated. Sample *A* was taken at low speed—34.5 ft. per min., while Sample *B* was taken at medium speed of 110 ft. per min. The material was mild steel: the depth of cut, heavy. There is a noticeable difference between the two samples as to the size, shape and structure of the chip and built-up edge: Sample *A*, Fig. 8, shows a semi-circular shaped edge, while Sample *B*, Fig. 9, presents one that is flat and layer-like.[7]

### 1. Influence of Cutting Speed

For SAE 1020, *i.e.*, mild steel, the built-up edge presents three shapes for the following cutting conditions:

Cutting feed 0.040 in. per revolution
Cutting depth 0.125 in.
Tool shape 8-14-6-6-6-15-$\frac{3}{4}$ in. *R.*, *i.e.*, 8 deg. back rake; 14 deg. side rake; 6 deg. end and side cutting angle; 6 deg. clearances; 15 deg. cutting angle; $\frac{3}{4}$ in. radius
Dry cutting

1. A semi-circular shaped, built-up edge formed at speeds up to approximately 50 ft. per min. (a speed range below that used commercially).

2. An acute top-angled wedge shape formed at speeds between 50 and 110 ft. per min. (speeds which are in the commercial range).

3. A flat, layer-like built-up edge formed at speeds of 110 ft. per min. and upward (slightly above those used commercially).

[7]Tests at intermediate speeds show a gradual change of form in the built-up edge between these two extremes.

### 1. Influence of Cutting Speed

Here all cutting conditions were constant except the material cut, which was SAE 2345, and here again the built-up edge shows forms identical with those above. Because of the difference in machinability between SAE 2345 and SAE 1020 as used in Section I, the cutting speeds were necessarily lower: (1) up to 20 ft. per min.; (2) between 20 and 26 ft. per min.; and (3) from 26 ft. per min. and up. It is interesting to note that the conclusions for alloy steel are identical with those for mild steel. Therefore, it would

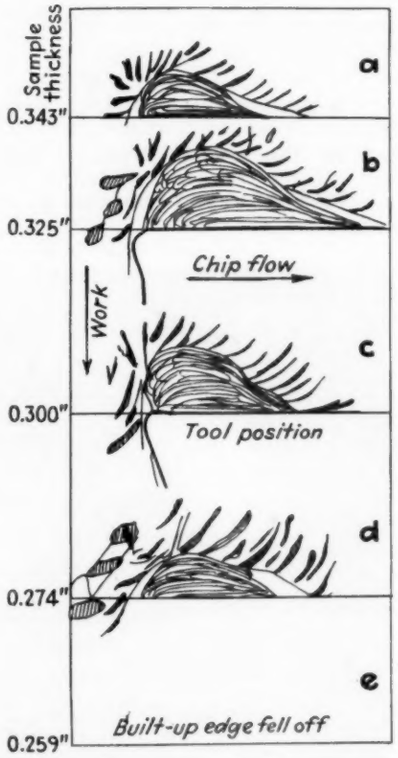



*Fig. 8—The thickness and length of the built-up edge for sample* A *changed at the various sections shown in Fig. 4; magnification, approximately 11 times*

seem natural to assume that since the form of the built-up edge is similar for any two ductile materials, its form might be alike for all ductile materials.

#### III. Influence of Cutting Fluids

Under the same cutting conditions as for the speed tests, an emulsion and a mineral oil were used as variables. Results showed that the size and shape of the built-up edge are greatly affected, especially in the lower range of speeds. For example, there was a 60 per cent increase in area at the speed of 10 ft. per min. However, at the upper range of speed, the same tendency, although noticeable, was not so marked. Incidentally, there was scarcely any noticeable difference between the outside views of the chips taken at all speeds used in the tests.

#### IV. Influence of Tool Shape

In this series, the side rake angle was the variable and the rest of the cutting conditions were constant, with the following results:

1. With increase in the side rake angle, the magnitude of the built-up edge decreases.

2. The ratio between the length of the built-up edge and its height is remarkably decreased. The shape of the edge assumes the appearance of a layer-like structure.

3. With a rake angle of more than 30 deg., the size of the built-up edge drastically diminishes, and gives hardly any protection to the upper surface of the tool.

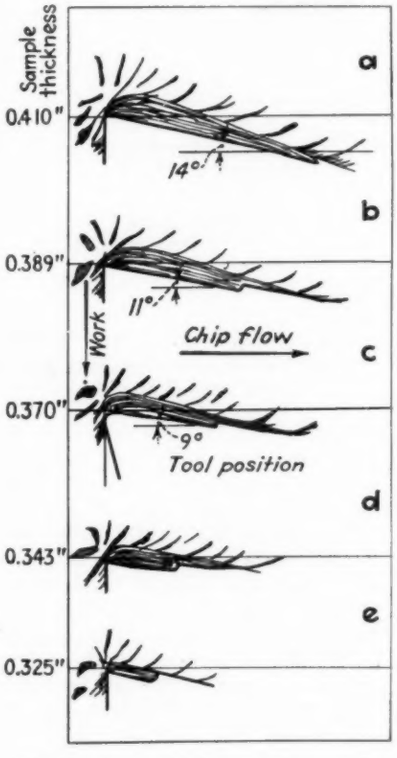



*Fig. 9—At the higher cutting speeds the built-up edge for sample* B *tends to flatten out. Magnification, approximately 11 times*

#### V. Influence of Depth and Feed

With an increase in the depth of cut, the wedge angle of the built-up edge is increased to an even greater extent than with a similar increase of feed. Moreover, with an increase in depth the relative size of the wedge grows greater than with a corresponding increase in feed for the same chip cross-section.

Considering the extreme complexity of the problem and the lack of scientific background, it is impossible to develop a general, practical formula governing the built-up edge formation. Some general conclusions of practical value suggested by the present findings are worth stating, however:

#### A. For Heavy Cuts

1. The built-up edge is definitely a protective agent for the cutting tool and prolongs tool life. For obtaining the highest possible protection for the machining of ductile materials with heavy cuts, the following factors will be favorable:

(*a*) Moderate speed

(*b*) Side rake angle of not more than 22 deg.

(*c*) Relatively heavy depth and feed

(*d*) Use of a suitable cutting fluid

2. The form of the built-up edge as revealed by the experimental technique described will also reveal the design and suitability of the cutting tool.

3. The finished surface of the material cut is influenced by the size of the built-up edge. With a large built-up edge the finish will be rather rough. For highly finished surfaces the built-up edge should be diminished.

#### B. For Light Cuts

For fine cuts on ductile materials where high finish is desirable, the size of the built-up edge must be decreased, to be effected by:

(*a*) an increase in speed

(*b*) an increase in the rake angle

(*c*) a decrease in depth and feed.

This article is condensed from the author's thesis presented for the degree of Ph.D. in Engineering at the University of Michigan, June, 1935.

*Fig. 7—Micro picture of built-up edge for sample* B *when the cutting speed is 110 ft. p. m. Magnification, approximately 70 times*

## When Using a Dowel

CHARLES WESLOW

Whenever you have two pieces to dowel together, always drill through one piece first and counterbore the hole at both ends a trifle larger than the dowel. Then clamp the two pieces together; use a sharp drill that has a narrow point on the end. Otherwise the pieces may shift, because of the clamps not holding them securely. Sometimes on account of the limited space available for clamps solid clamping can not be effected.

If you want to prove to yourself the need for these precautions take two pieces of scrap cold-rolled or tool steel, ground on the surfaces that come together. Drill through both pieces, holding them together with a strong clamp. Then measure with a micrometer over the two pieces and record it. Then take off the clamps, and measure the two pieces again, and you will find how the drill has thrown up a burr on the surfaces where they meet. The micrometer tells the story.

# DROP FORGING INSERT DIES

**Tougher forgings result from proper preparation of blanks while lower cost is obtained by the use of insert dies for sizing**

**J. H. SKERKA**
*Tool Design Department*
*Westinghouse Electric & Mfg. Company*

TO DECREASE unit costs, Westinghouse has given considerable thought to drop forging methods. For either high or low production, insert dies are applicable to work such as gears, covers and other symmetrical designs. Forgings with bosses or other projections which might cause rocking of the dies are not satisfactorily produced in this way. The most common types produced by this method are shown in Fig. 1. Savings as high as 50 to 66 2/3 per cent have been effected through the use of insert dies.

Inserts, such as shown in Fig. 2 for use in a master block, are used instead of making solid forging dies. Several sizes are made at one time and kept in stock. They are made of chrome-vanadium steel containing 45-55 carbon and are hardened to 42-47 Scleroscope before finish machining. Machining at this hardness is best done by using tungsten-carbide tipped tools.

The 90-deg. V's shown on each side of these inserts are for holding purposes. When the inserts are placed in the master blocks they are held together by special tapered keys. These keys are swaged into the blocks to keep the inserts solid to withstand the constant pounding of the hammer. Two counterbored screw holes diametrically opposite each other are used for eye bolts when placing and removing the inserts from the master blocks. A third hole is for a dowel pin for lining up the upper and lower inserts.

Different sizes of master blocks are also carried in stock for the various sizes of inserts, as shown in Fig. 3. These blocks are made from the same steel as the inserts and are heat-treated like them. The tangs are machined to different sizes so as to be used either on the board drop or the steam hammers. The slots for cut-off cutters are put in these blocks in case the work to be forged is from bar stock. They protrude from 1 to 1½ in. beyond the blocks to allow for bar clearance. The holes on each end are for handling as shown in Figs. 3 and 4. The large hole in the center of the blocks is used for applying a ram in case the insert sticks. The other small hole is for lining up as explained above. The slot in the tang is to fit a key located in the sow block to keep the master block from coming loose. These blocks

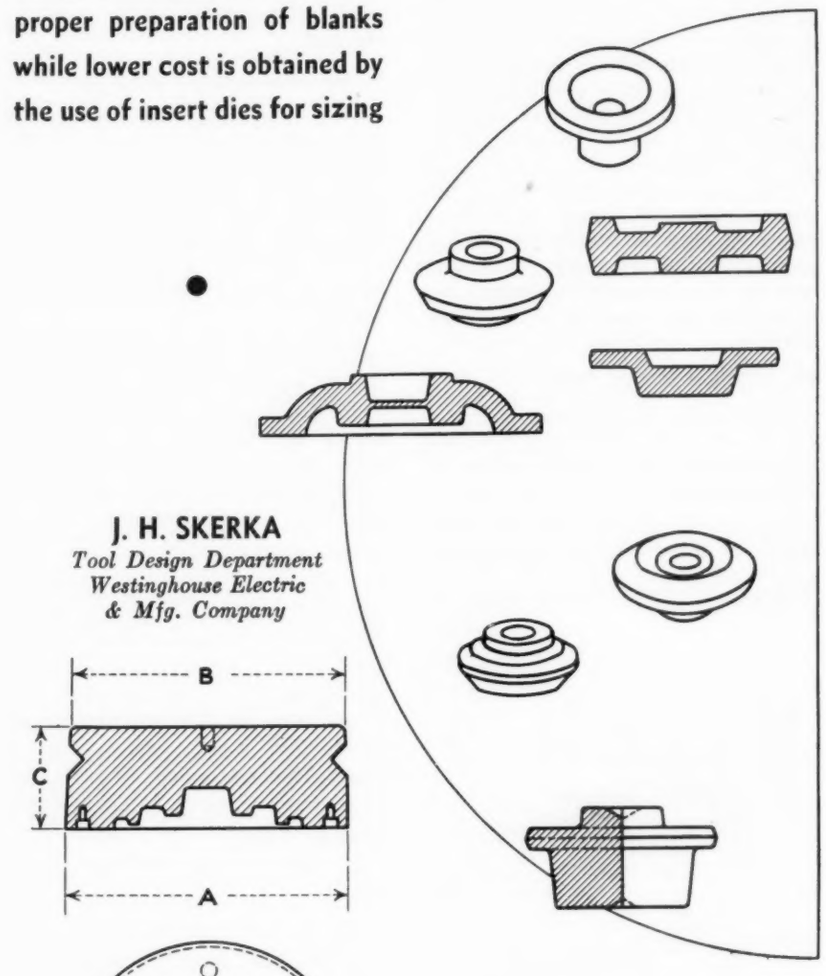
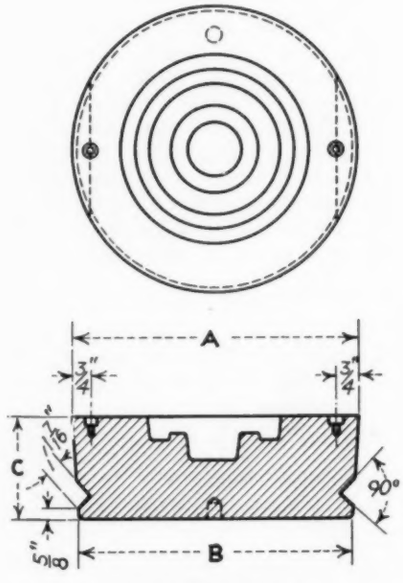



*Fig. 1—Circular, symmetrical forms such as these lend themselves best to the method described*




| A | B | C |
|---|---|---|
| 8 | $7\frac{15}{16}$ | 4 |
| $10\frac{3}{4}$ | $10\frac{11}{16}$ | $4\frac{1}{4}$ |
| 13 | $12\frac{15}{16}$ | $4\frac{1}{2}$ |
| 18 | $17\frac{15}{16}$ | $4\frac{3}{4}$ |

and inserts are placed in numerical order in special racks near the hammers ready for use.

The blanks for use in these drop forged inserts are cut off in the storeroom from bar stock of proper diameter and length according to the particular forging desired. The sizes for each different size of blank are developed to best advantage in tryout procedure. In this procedure, it is nec-

*Fig. 2—Inserts of chrome-vanadium steel are made in a series of sizes to be keyed into master blocks when in use*

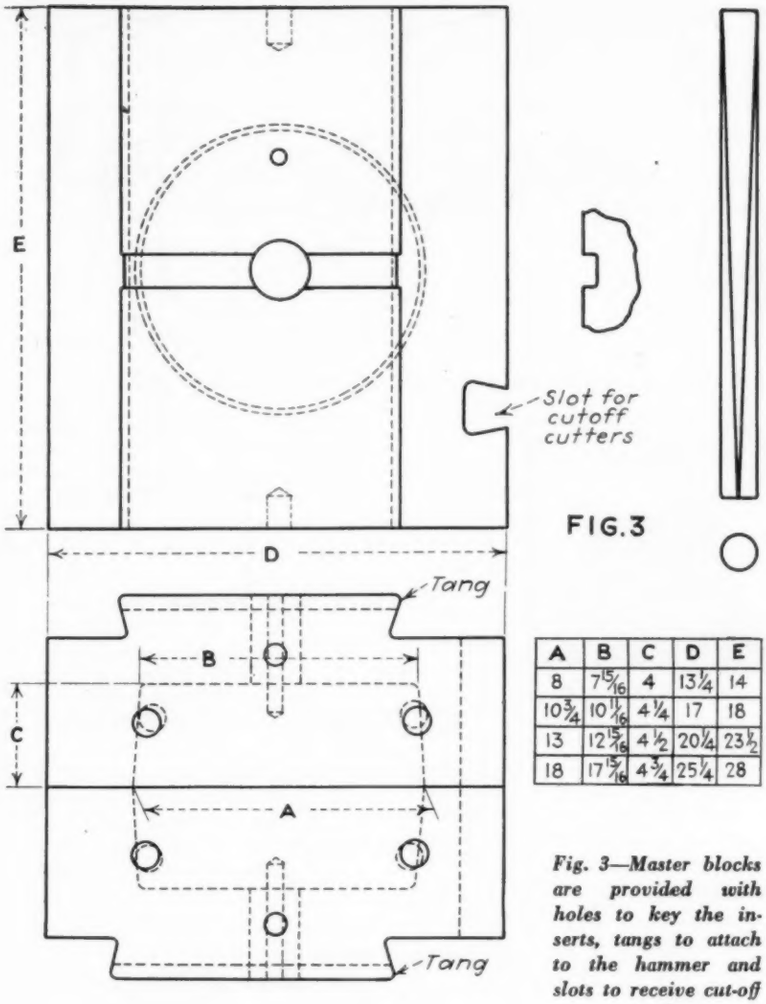



FIG. 3

| A | B | C | D | E |
|---|---|---|---|---|
| 8 | 7 15/16 | 4 | 13 1/4 | 14 |
| 10 3/4 | 10 11/16 | 4 1/4 | 17 | 18 |
| 13 | 12 15/16 | 4 1/2 | 20 1/4 | 23 1/2 |
| 18 | 17 15/16 | 4 3/4 | 25 1/4 | 28 |

*Fig. 3—Master blocks are provided with holes to key the inserts, tangs to attach to the hammer and slots to receive cut-off tools*

*Fig. 4—Ready for use, the master block is shown with inserts and cut-off tools in place*

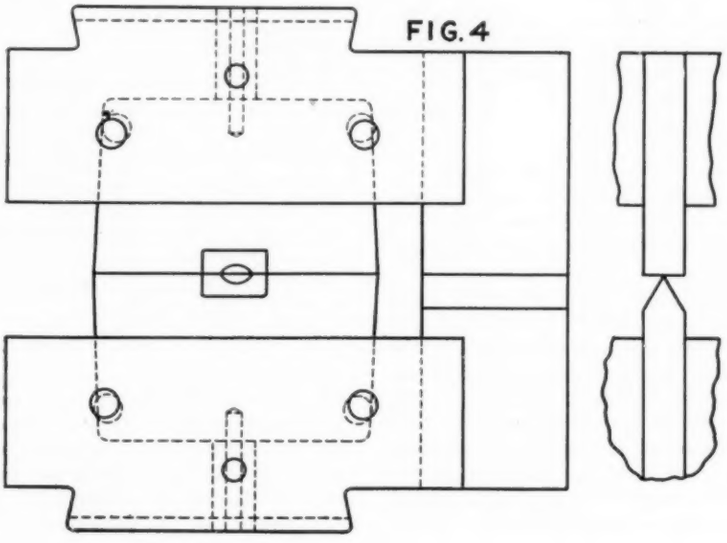


FIG. 4

essary to allow enough material for loss by scale and flash, the flash to be trimmed off later. These blanks are used mostly for round work and gears where severe service is not required. For the standard run of gear blanks where no impressions are required, they are forged and worked by a sizing method without the use of insert blocks.

The operations required to forge a blank ready for use are shown in Fig. 5. This method is used mostly for standard gears, such as spur, helical and herringbone, which are forged or sized to produce very little flash. At *A* the operator hammers the stock to approximate size, ready for the sizer, as shown at *B*. This is where the material is hammered to change the grain. The sizing attachment is fastened to the hammer with a stripper ring welded on the opposite side. After hammering the blank to the sized dimension, it is placed in the final sizer as shown at *C*. The operator then hammers the blank until the ram of the hammer hits flush with the final sizer. When these sizers wear large, they are used for the next larger size of blank. After using the final sizer, the stripper is swung around 180 deg. to strip the blank which slides down a small chute where it is ready to be machined ready for use as shown at *D*.

## Cooling the Final Sizer

The final sizer is kept cool by placing it on two bars welded across a small tank and keeping a continuous spray of water running over it. This tank is located alongside of the hammer handy to the operator.

When special work is to be forged, as shown in Figs. 6 and 7, the grain of the blank must be changed so as to withstand the wear. This requires a separate operation, where the operator changes the directional flow and also densifies the grain to produce a forging of quality to withstand tests for all types of work.

Fig. 6, left, the first operation and the condition of the flow of the grain are shown. This is the stage where the operator hammers the material to change the directional flow of the grain. Directional flow of the grain, at right, is changed by pressing a plug as shown. Then is shown the finished operation, which produces the desirable forging as shown in Fig. 7. The undesirable forging is forged without special operations.

Two important precautions are well to emphasize:

1. Never put more than one impres-

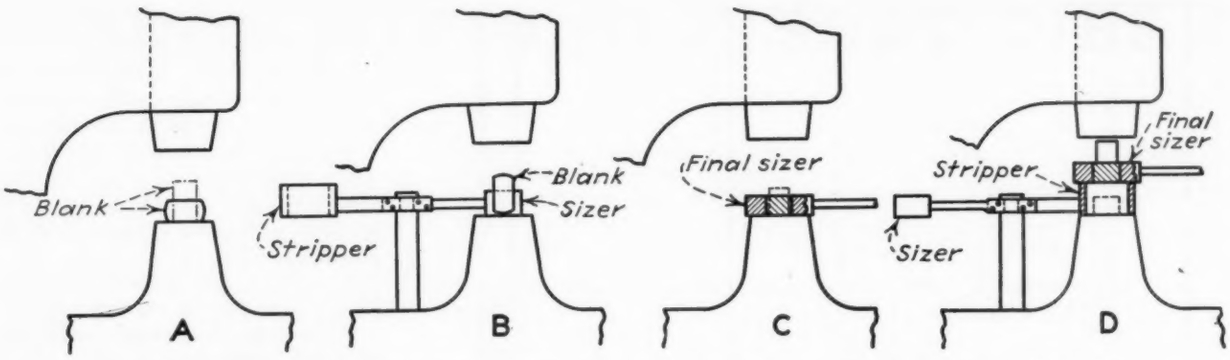



*Fig. 5—Where no impression is required the procedure pictured gives grain refinement with little flash*

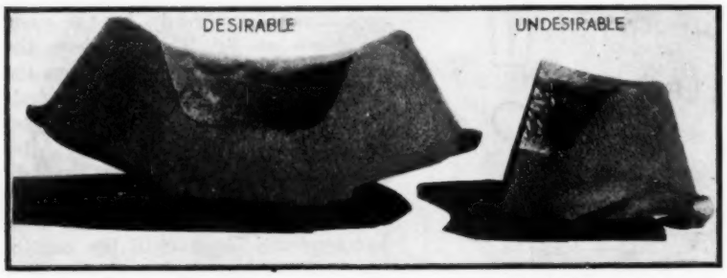



*Fig. 7—Grain flow of a properly forged blank is contrasted to that in a blank made without special treatment*

sion in the inserts. If this precaution is not taken, the impressions will be off center as shown in Fig. 8. This would automatically cause a rocking condition when in use on the bot om of the master block, which would ,all the tapered keys and loosen the inserts.

2. Always make sure that both inserts protrude at least $\frac{1}{32}$ in. above the surface of the master block so as to prevent swaging over as shown in Fig. 8.

When forgings of special steel and of larger diameter are required, it is advisable to have them upset on a steam hammer or a hydraulic press instead of a board drop. This eliminates extra blows and helps to reduce the cost.

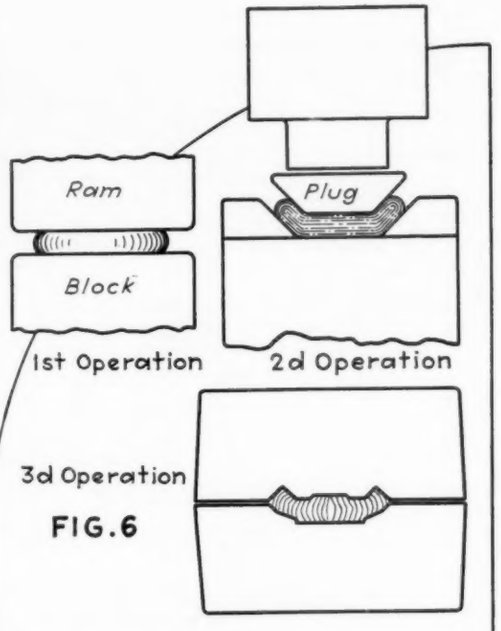



*Fig. 6—For severe service it is advisable to add an extra operation to change the direction of the grain*

## 30-Hour Week Again

In a radio interview, broadcast recently over the NBC network, Ralph E. Flanders, president, Jones & Lamson Machine Company, contributed a strong argument against compulsory shortening of the work week.

Said Mr. Flanders in part: "With the more or less obsolete equipment with which our manufacturing plants are filled it will be impossible to do more than maintain our present unsatisfactory standard on a 40-hour week. We would have to live more simply, more poorly, more meagerly if we went to a 30-hour basis, even if everyone were put to work. And everyone could not be put to work on a single-shift basis. A large percentage of workers would have to go onto a night shift owing to lack of equipment.

"It is interesting to note that those trades which have succeeded in getting onto a basis of a shortened working week are the very ones which are slowest in making a recovery. The short hours and corresponding high wage rate of the organized building trades, for instance, have tended to keep its members *unemployed* instead of inducing recovery."

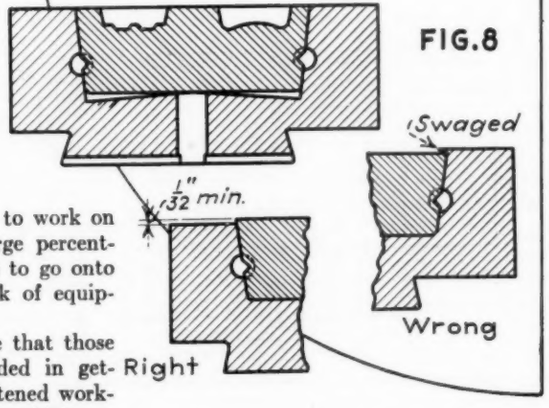



*Fig. 8—Inserts should carry only one impression to avoid rocking action that will eventually loosen them. If inserts extend slightly above the surface of the master block, swaging action will be prevented*

# Talking Shop

### Cast Aluminum Bodies

Automobile bodies have seen many changes, not only in style but in construction. Perhaps the most violent contrast is between the cast aluminum body of the Pierce-Arrow in the days when the open touring car was the proper mode, to the all-welded steel body of the Lincoln-Zephyr. The old Pierce-Arrow body was a large casting, probably about 3/8 in. thick except for the edges, and was quite a job to cast and finish. The affinity between the body and a coat of paint was not all that could be desired. But they licked that after awhile. Now we take a few hundred comparatively small pieces and weld them into a unit that is stronger than ever before.

*The machinery business is a funny business. We know of a shop where standard milling machines that cost $175,000 are stored in idleness in one bay and $75,000 worth of fixtures for them in another bay. This whole equipment, bought for a specific job, became obsolete when one special machine was brought in. But here's the queer part of it. The machine was bought for $8,000. It cost the builder $17,000. You figure out the answer.*

### Stiffness of Steels

Boring long holes of small diameter is made harder by the tendency of the cutting tool to spring. So the toolmaker wants to know the stiffest kind of steel for the bar, and unless he has some knowledge of the theory of strength of materials he will be surprised to find that it makes little difference what steels are uniform in stiffness regardless of the carbon content or heat-treatment, and that the effect of

adding alloying elements is hardly noticeable. If he will consult the metallurgist or an engineer he will be told that the modulus of elasticity of steel is practically a constant and that that is the reason all steels are about equal in stiffness.

### Technology Volunteers

William K. Stamets, a leading machine tool dealer of Pittsburgh, wrote us vividly of his observations of the recent flood's devastation—and what machine tool men did to help factories to get back into production. Technocrats, he remarks, might be interested to know that:

In such an emergency, one boat with an outboard motor was worth six row boats.

One modern radio station was worth 10,000 Paul Reveres, and did more to aid the distressed thousands and to mobilize relief than the whole U. S. army could have done.

When the power went off, butchers refused to grind and slice meat by hand.

Automobiles, a favorite target for critics of the machine age, saved hundreds and brought relief to thousands.

*"It takes a major disaster to bring out the virtues of human nature. Volunteers, firemen and police worked 36 hours, with little to eat, performing heroic deeds which at the time—to them at least—seemed a commonplace. And Pittsburghers, accustomed to responding to appeals for help from other sections of the country, were touched by the sincere evidences of friendship which came to us from all over the nation." Mr. Stamets' letter was written before the water had receded and as his city was "digging out."*

### Bets

W. Wallace McKaig, Cumberland Steel Co., wrote: "During the night of the flood we were laying bets as to whether two big oil tanks, pounding at the bridge, would break through. Luckily, the bridge won. A storekeeper came pretty near being the city's only casualty. He was moving his stock to safety when the plate glass window broke, he was carried out into the street by the flood and was swept two blocks and thrown into another store. Men upstairs heard his calls, and hauled him to safety with ropes."

### Tool-Setting Time

Shutting down an expensive machine to change tools costs real money. To reduce this "down" time as much as possible one large user of special, high priced machines has a good dial indicator built into every tool head on the machine. These indicators save time in resetting the tools and also help to insure uniform product. The cost of the indicators has been well paid for by the increased production and the accuracy of the product.

*The Government Printer offers to sell bound volumes, 23 in a set, containing all NRA codes, for the modest sum of $34.50. Who knows what they may be worth a hundred years hence to historians researching among New Dealiana? Possibly this would be a good speculation.*

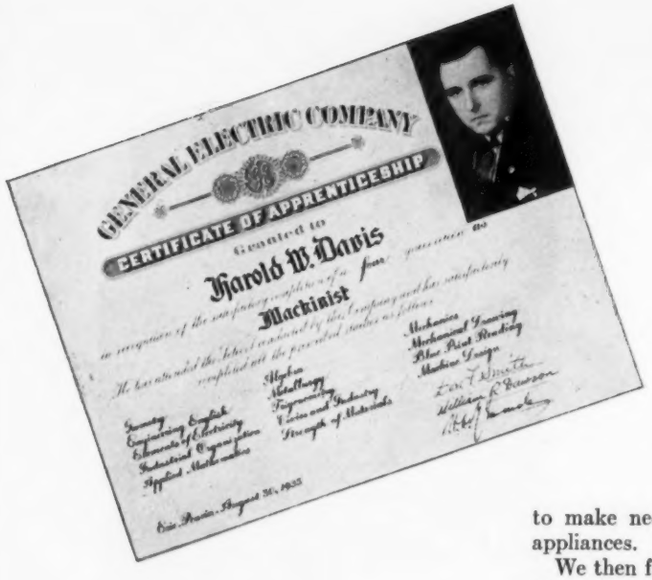
### Motors to Music

The Standard Motor Company, of Coventry, has introduced a system of broadcasting of gramaphone records to employees during working hours. According to *Industrial Britain*, the innovation has proved so successful that

eventually loud speakers will be installed in all workshops where the noise of machinery does not make it impossible to hear the music.

At present a program is given for one hour in the morning and one in the afternoon. Equipment is also in constant use during the lunch hour when the workers get up impromptu dances among themselves.

—*The Editors.*




# 30 YEARS of

**DON F. SMITH**
*General Superintendent,*
*Erie (Pa.) Works, General Electric Company*

FOR MORE than thirty years apprentice training has been an important part of factory management in the General Electric Company. Today it is one of many company training programs, each designed to furnish trained employees for a definite purpose. There are now, in the eight apparatus plants of the company, 450 machinist apprentices in training, less than half the number in the course in 1929. The reason for this reduction has not been a change in policy of the company or a decrease in the value of the apprentice graduate in factory work. It is, however, impossible to train apprentices properly without giving them high grade work in the factory. During a severe depression there comes a time when we must choose between apprentices and the highly trained nucleus of our experienced men.

Any training course must be built around the object of the course. As was probably true of all apprentice training in the country, the General Electric system was first started to produce skilled mechanics. The original apprentice program provided an opportunity for ambitious boys to learn a trade with a minimum amount of organization and little direction, except by the regular production organization. Later, as specifically trained men were wanted in large numbers, it was found advisable to appoint some reliable, mechanically trained man to the job of guiding the boys.

Next came the thought of providing some educational opportunity. We needed more broadly trained men since we were using more complicated processes in industry, chemical, electrical and mechanical. New machines of higher speed and new processes required a higher type of service to keep them going—a higher type of mechanic to make necessary tools, fixtures and appliances.

We then found the apprentice graduates working their way into supervision and factory office work, for which their foundation training in mechanics and machine tool operation proved extremely valuable. Further thought was then given to rounding out the course to provide more useful training to those boys who might leave the machines and take up other work. Thus, we have seen the original machinist's training grow and broaden to meet the present day requirements.

In the General Electric Company, because of the individual requirements of each works, there is naturally some variation in the respective apprentice systems. Therefore, in order to have a General Electric apprentice certificate represent the same general grade and amount of training, the following outline of requirements has been adopted:

## Machinist Apprentice Course

1. Boys chosen for this course will be between the ages of sixteen and twenty-one inclusive, with high school education or the equivalent.

2. Total number of hours of training required—7,200.

3. Total number of hours of shop training required—6,400.

4. Shop training to include not over 3,600 hours in an apprentice training machine shop, and a minimum of 3,600 hours experience in factory departments. The factory experience to be sufficiently varied to provide general machine shop training on production work.

5. Number of hours of school training—800.

6. School training will be in accordance with the following schedule:

| | Hours |
|---|---|
| **Mathematics, including advanced or applied arithmetic, advanced algebra, geometry, and trigonometry** | **160-180** |
| **Drafting** | **90-100** |
| **English, including letter writing, report making, etc.** | **40- 50** |
| **Blueprint reading** | **30- 40** |
| **Electricity, including laboratory work** | **60- 70** |
| **Metallurgy, general, largely principles in connection with heat treatment** | **30- 40** |
| **Machine Design, including machines and tools** | **40- 50** |
| **Applied Mechanics or Advanced Physics** | **90-100** |
| **Strength of Materials** | **40- 50** |
| **Required** | **640** |
| ***Allowed Selective Subjects** | **160** |
| **Maximum Allowed** | **800** |

At the present time there is only the one machinist apprentice course. In the past we have had numerous combinations in which the boys were taken

**These subjects are to allow some leeway for special education as desired by individual plants.*

92D343

RATING SHEET

Date _____ Name _____

Department _____

Duties _____

DIRECTIONS

1. Base your ratings on your own direct knowledge of the employee's performance in the line of his job, compared with the average man doing the same work.
2. Concentrate your attention on one trait at a time disregarding the rest of the traits for the time being. Do not allow your judgment on any trait be influenced by your general opinion, whether favorable or unfavorable, of the person you are rating.

| | | |
|---|---|---|
| Ability to Learn | EXCEPTIONALLY KEEN AND WIDE AWAKE | USUALLY GRASPS NEW SITUATIONS QUICKLY |
| Quality of Work | HABITUALLY ACCURATE AND THOROUGH | USUALLY ACCURATE |
| Initiative | DEVELOPS AND EXPANDS HIS FIELD OF WORK | USES OUT OF HIS WAY TO GET RESULTS |
| Quality of Work | DOES UNUSUAL AMOUNT OF WORK | DOES MORE THAN REQUIRED WORK |
| Co-Operation | GOES OUT OF HIS WAY TO ASSIST OTHERS | GOOD TEAM-WORKER |

IMPORTANT

Comparing this employee with others doing similar work, how do you rank him?

SUPERIOR | ABOVE AVERAGE | AVERAGE

Remarks _____

Rated by _____

# APPRENTICE TRAINING

**In its eight apparatus plants the General Electric Company has trained thousands of apprentices. 450 are in training now, hundreds more are on the waiting list**

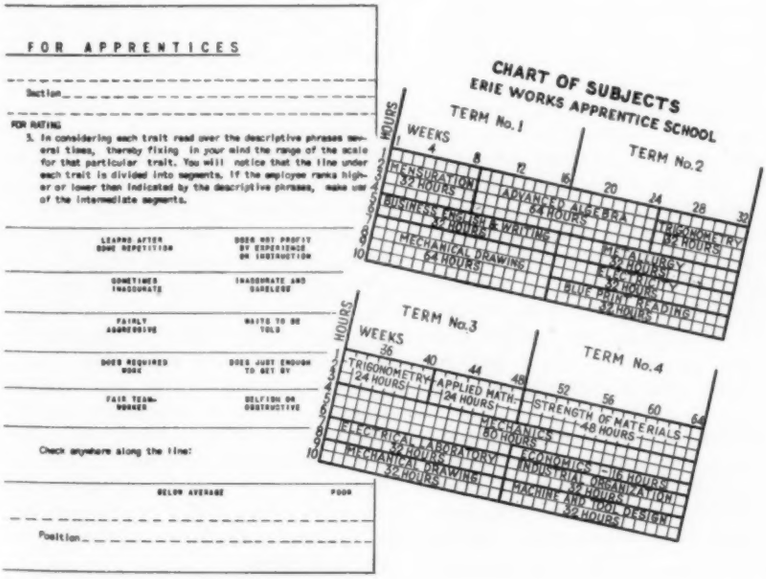
from the machinist apprentice course before graduating and given special training, graduating as apprentice draftsmen, technical clerks, etc. Our experience has shown that there is a distinct benefit in having the machinist apprentice graduate as such from the apprentice course and with this as a foundation take up such special training as may be required to fit him for other types of work.

ONLY high school graduates are now accepted for the apprentice course. With the large number of boys now graduating from high schools in the United States, we feel there is no necessity for incurring the expense of high school education. The proper selection of boys for an apprentice course is not only important but difficult. Entrance examinations and school grades provide a measure of mental ability but it is not easy to discover whether a boy is mechanically inclined and earnestly desires to learn a trade in the factory. There are many types of mechanical aptitude tests and while probably none of these is perfect, they are of some value. Some of this work is now being used to determine the mechanical ability of applicants.

There are always plenty of applications on hand for a good apprentice course, regardless of economic conditions in the country. At the Erie Works we have continually had on file over 400 applications. The maximum number of boys started in any one year was 50. These applications come not only from all parts of the United States but occasionally from other countries.

The top-notchers of the small town high schools have proved a very reliable source for apprentice material. In recent years we have been besieged by boys who had been forced to give up plans for college education. While a number of these boys have been taken on, their batting average has not been as good as that of the boys who chose the apprentice course as the height of their ambition.

The application forms used call for the usual social and physical history. The applications are accompanied by high school grades and a letter from the principal of the high school. From this material the most desirable applicants are chosen. At the Erie plant approxmiately three times the number desired for the next class are requested to appear at a definite date for the final-selection interview. This selection is made by a committee composed of the chairman of the education committee, supervisor of education, supervisor of apprentice training and the general superintendent. The boys finally selected are asked to sign an apprentice agreement, which is also signed by parent or guardian.




In all of the plants, the apprentices are first started in a training room in order that they may become acquainted with factory life, factory organization and routine before starting work in the production departments with the older men. Apprentices are paid for all time spent in shop or apprentice school. Rates of pay start at 32 cents per hour and increase at six months intervals to a final rate of 50 cents per hour.

The apprentice training room resembles one of the manufacturing departments of the plant. It is equipped with a large variety of machine tools, not obsolete or cast off from other departments but as up-to-date and in as good a state of repair as that in other machine shops throughout the plant. The work in this room is supervised by one or more persons chosen for their training as machinists, their general knowledge of shop mechanics, and their ability and patience to teach others what they have learned.

The work done in the training room is largely regular production work obtained from manufacturing departments throughout the plant. The remainder of the work is in the nature of mechanical maintenance work or, in exceptional cases, practice work for training only. We believe there is a distinct advantage in training the boys on production work in order to bring in time allowance, cost, and effect of spoilage. During the time in the training room, class room demonstrations of the use of hand tools as well as of machine tools are given. These are very helpful in teaching the boys the "why" of machine tool operation.

After completion of the training room period the boys are assigned to machine departments in the factory. Here they are placed on production

*A long term investment*

work and depend upon the foremen and experienced shop employees for further instruction on machine tool operation. A record is kept in the apprentice department of all of these boys who are in the factory and their transfers are supervised in order to round out their shop training. This factory training includes work in tool repair shops, maintenance departments, toolrooms, and assembly departments, as well as in manufacturing machine shops.

SOON after the boys start their work in the training room they enter school. The educational work is done either in company schools or in cooperation with local school facilities. In the majority of cases the company school is used for all or part of the school work. There is some advantage in the company school since it affords another opportunity for studying and developing the personalities and characteristics of the various boys. The company school instructors have the training to teach college work and in addition have been associated with the factory a sufficient length of time to allow them to present the practical application side of the school work.

The majority of work given in the apprentice school is of direct benefit in connection with skilled occupations in the factory. Some of the mathematics, physics, design and higher mechanics may be classed as brain-development work not directly useful in the shop. Under selective subjects, which are limited to 160 hours, are given elementary economics, industrial organization, wage-payment systems, and other subjects of a general broadening nature or of specific relation to the company's business.

The boys are graded on the various subjects taught and individual records kept. They are also graded on their training room and factory work, the latter grade being furnished by the foreman. Periodic reports are sent to parents or guardians in order that they may know the standing of their boys and may assist in stimulating them to greater effort in case their grades are becoming dangerously low. If a boy fails in his work, either school or shop, he is dropped from the course—although every effort is made to assist him. The only boys who fail are those who do not have the ability or who refuse to apply themselves. In some cases, when they fail in school work but are exceptionally good in the shop, they may be permanently transferred to shop work and dropped from the apprentice course.

At regular intervals during the school training, factory superintendents, department heads and specialists are brought into the classes for informal discussions, thereby allowing the boys to become acquainted with the personnel of the organizations as well as with the company's routine and policies. The school and training room instructors do all possible to develop and safeguard the character of the boys so that the company investment may be protected.

In all plants, a night school is conducted for the benefit of employees. In the night school, courses are given which are additional to the work given in the apprentice course, thus making it possible for the boys to continue their educational work after completing the apprentice schedule, if they so desire. This is encouraged and many of the boys take up special subjects related to work assigned to them both before and after graduation.

When the apprentices have completed the required number of hours of training and school work successfully they are given a bonus of $100.00, a certificate of graduation, a General Electric apprentice pin and identification card. After graduation the boys are not entirely dropped from central supervision. Contact is maintained by the personnel department, the education committee, and an apprentice alumni association. Permanent records are kept of the graduates and an active file maintained of those both within and outside of the company as far as possible.

THE results obtained from the apprentice systems are difficult to evaluate in dollars and cents. Because of the educational work, extra supervision, excessive spoilage and inefficiency of the majority of apprentice shop work, the total cost of the training cannot be covered in production costs. Some of this expense is offset by work done in the last part of the course at apprentice rates below normal job rates. However, at the point of graduation the apprentice still stands on the books as an unliquidated investment. In spite of this, if we consider the jobs occupied by the apprentices after graduation and what it would cost to train men for these jobs by any other means, the whole cost of apprentice training is more than offset.

At one plant apprentice training was started in 1902. To date 1,400 boys have graduated from the course. Besides machinists, toolmakers, and factory supervisors, the graduates remaining with the company include 1 works manager, 1 assistant works manager, 1 general superintendent, 1 mechanical superintendent, 2 district office managers, and 50 district office and service shop employees. Among those who left the company we find 25 in power stations, 73 in educational work, 2 associate editors of trade magazines, and 65 in arsenals and navy yards. Eighty per cent of the drafting force in this plant are apprentice graduates.

These summaries illustrate that the General Electric apprentice system produces a large amount of useful material besides machinists. We believe that this is as it should be and we know of no better or cheaper way of properly training employees for these positions.

# DIE DESIGN and DIE MAKING

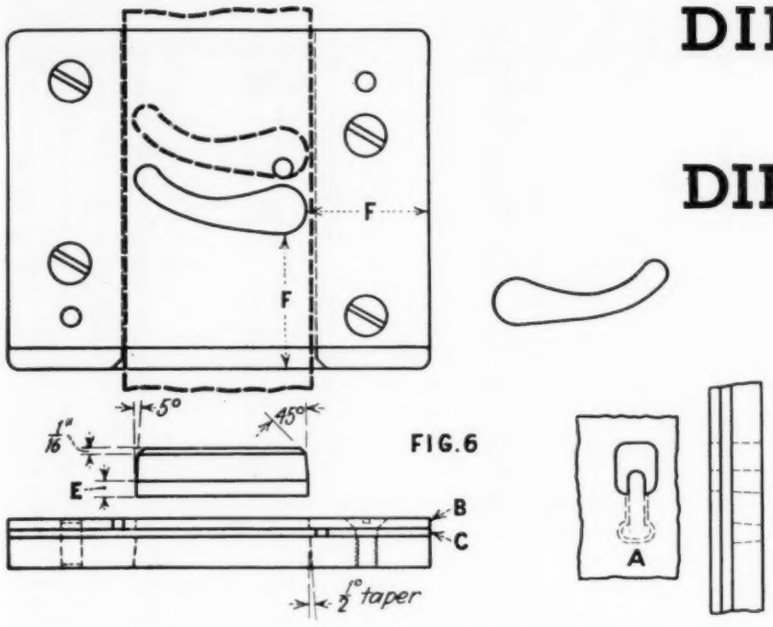



FIG. 6

*Fig. 6—This temporary blank die is used between planish blocks; detail A shows the method of using an insert where the die block is weak*

E. G. MARSHALL
*Master Mechanic, Charleston Works, The American Fork & Hoe Company*

**II—Unmounted blank dies are cheapest for producing a few thousand parts, but their economy does not imply lack of care in design and construction**

TEMPORARY blank dies are used between planish blocks in the punch press. These blocks are obtained either by making or purchasing a plain die shoe and a plain punch holder and then making a tool steel plate to fit the holder. The thickness can vary, but ¾ to 1 in. for plates 8x16 in. has worked well. These are hardened and ground.

For shops with small production or with a model that has a low yearly quota, the type of blank die shown in Fig. 6 is recommended. With a total production of 20,000 parts for the life of the die, this type is about as inexpensive in over-all cost as can be used. The labor cost will run high, but the original cost will be much cheaper than for a mounted die. For example, a temporary die costs $50 and 10,000 parts are to be made at a labor cost of $10 a 1,000. Compare with a mounted die costing $150 to make and 10,000 parts with a total labor cost of $1. The two methods of making parts would balance so far as cost is concerned at approximately 50,000 parts. Even with the high labor cost it will be cheaper to use this type of die than to make any amount of hand-made parts

At *A* in Fig. 6 is shown the method of using inserts at weak sections that break easily and can be more cheaply repaired by making a new insert instead of a new die block. When using inserts make and harden the die block first. Then taper the part that holds the insert, the large dimension being at the top. Make the insert a drive fit in the die and finish the working edge to size. Let the insert extend ☆ in. on each side of the die block. and then harden. Drive in the insert and grind it flush with both sides of the die block.

The top plate *B* in Fig. 6 is known as the punch locater. This plate can be made from ⅛-in. cold-rolled steel. As it locates the punch accurately over the die opening, the punch should have a snug sliding fit in the punch locater plate. It should fit the punch all around and not in a few spots. To locate the punch locater plate, proceed as follows: Drill screw holes in the plate and clamp to the die block. Place the punch in the plate opening and let it extend a short way into the die block. With feelers check the clearance between the punch and die and move the locater plate until it is evenly divided. Then transfer the dowel holes from the die block to the plate.

Stock guides *C*, Fig. 6, should be made from ☆ to ☆ in. thicker than the stock thickness. This allows room to move the strip freely even though it distorts in blanking. Place the stock guides on the die block ☆ in. farther apart than the high limit for the width of the strip stock.

The die block should be made of a good grade of tool steel and carefully hardened. Oil hardening steel will distort less than water hardening steel The designer should be careful that dimension *F* is never less than 1½ in with a die-block thickness of ⅜ in. and a pressure of 20 tons. With dies from 20 to 50 tons make dimension *F* equal to 2 in. and keep the die-block thickness ⅜ in. For pressures over 50 tons use 3 in. for dimension *F* and increase the thickness of the die block. For a 100-ton die the die-block thickness should be ¾ in.

When assembled the thickness of the die block, the stock guides and the locater plate should equal the thickness of the punch plus the thickness of stock. Straight section *E* on the punch in Fig. 6 should have a "hold" in the locater plate at least equal to one-half the thickness of the locater plate when the punch starts to enter the die block This will insure that the punch cannot slip or be forced sideways and shear the cutting edge on the punch and die.

At the same time *E* should not be long enough to cling in the top of the tapered opening when the ram is at

the end of the down stroke. The blank and the punch should drop freely out of the die block. Should the punch cling in the die block, the operator must knock it out each time. This would delay the operator and cause a higher labor cost for the parts. The usual taper in the die opening is ½ deg., although if it is desired to hold the size longer a smaller taper of ¼ deg. can be used.

In operation the punch press has a loading table in front of the planish blocks for the safety of the operator when unloading and reassembling the die for each blank. The strip is entered at the front end of the die and pushed forward until the edge of the stock passes the blank opening. The punch is then set in the opening in the locater plate and on top of the stock. The operator should be sure that the punch rests flat on top of the stock, because if it is locked at one point it can ruin the die. The die is then pushed in on top of the lower member of the planish blocks and the press is tripped. The die is pulled out on the table and unloaded and the stock moved forward until the blanked-out opening shows right in the sight hole. Then the punch is replaced and the operation is repeated.

There is a rule that the width of blank parts cannot be less than the stock thickness. Fig. 7 shows a blank die used for making a part in which narrow prongs are 0.032 wide while the stock thickness is 0.0625 in. The die was made in the usual manner except for the following changes: The punch was drawn to a blue color when tempering to soften the prongs enough so that they would not break off: This caused the punch to collect metal and gall in blanking the stock. To overcome this the sides of the prongs on the punch were stoned for every 100 blanks. Prongs on the part thin down and one side has a radius over the prong. The metal thins down about 0.010 in. but without rupture or defect. The die has made 2,500 parts and is considered fit for many more.

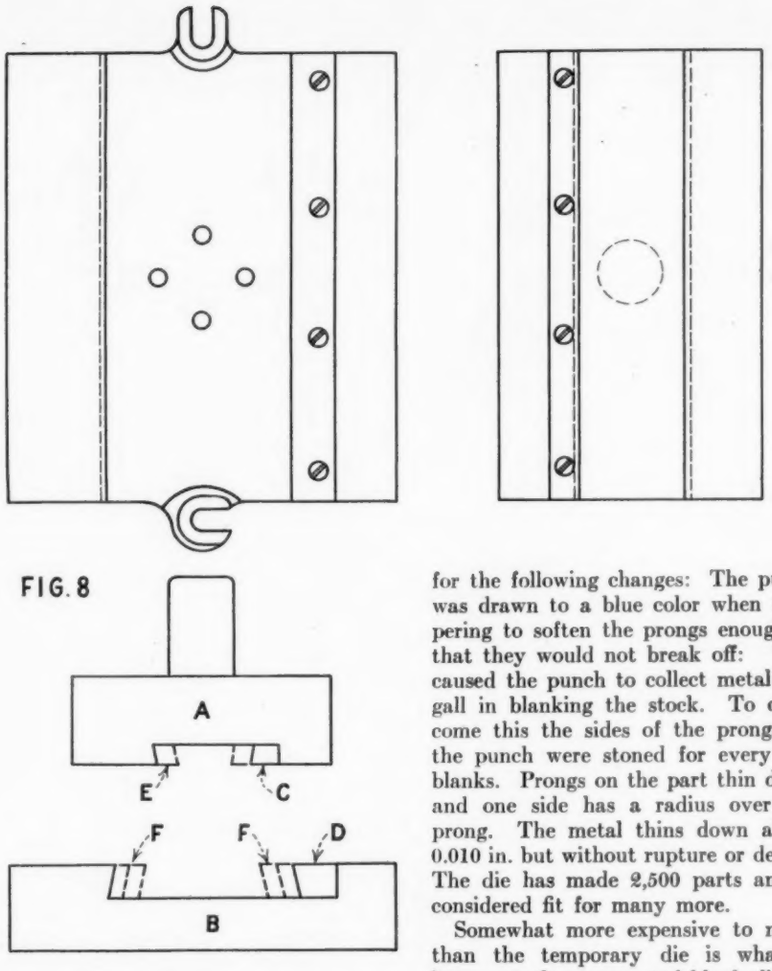



FIG. 8

*Fig. 8—Universal punch and die holders can easily be made to take a number of unmounted blank dies*

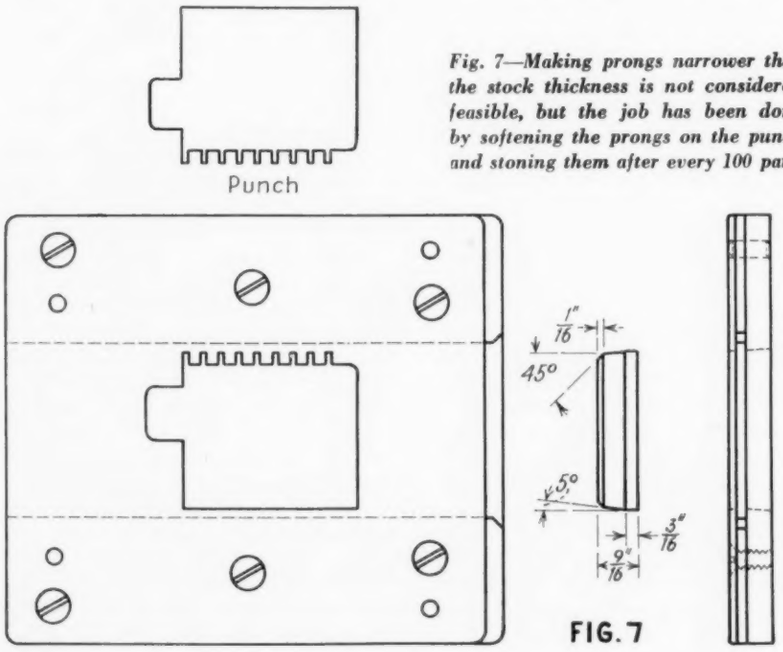



FIG. 7

***Fig. 7—Making prongs narrower than the stock thickness is not considered feasible, but the job has been done by softening the prongs on the punch and stoning them after every 100 parts***

Somewhat more expensive to make than the temporary die is what is known as the unmounted blank die intended to be used in a universal holder. Labor cost of this die is somewhat less than with the temporary die. Although this unmounted blank die is not mounted on a regular sub press, it is otherwise similar to a mounted job.

The universal holder, Fig. 8, can be made from a plain die shoe and a plain punch holder. At *A* is the plain punch holder, at *B* is the plain die shoe, and at *C* and *D* are cold-rolled strips to clamp the punch and die. These strips are attached with fillister-head screws. At *F* are cold-rolled strips to take different widths of dies and punches. By using spacers *F* any number of tools can be used in these holders. When the number of tools is large enough it is best to have several sets of holders, one for each width of die and punch. A badly worn punch press will ruin this type of tool very rapidly.

The thickness of the holders will depend on the shut height of the press, the required thickness of the die block, and the length of the punch. For example, a 25-ton punch press has a shut height of 8 in. and a ram adjustment

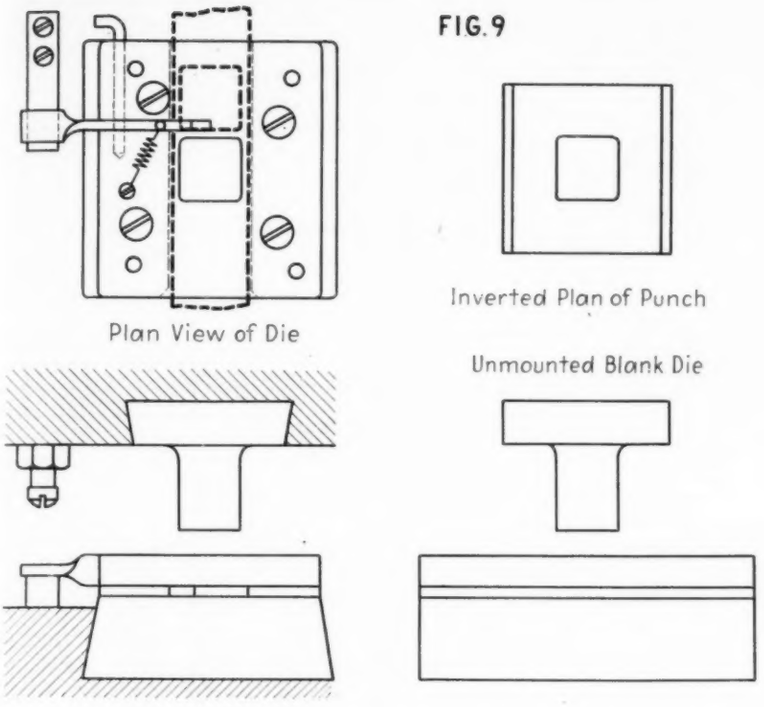



*Fig. 9—A more productive unmounted die, and one that is closer to the mounted die in regard to efficiency, is this tool fitted with an auto stop*

of 3 in. Thus, total thickness of both holders and the punch and die will be between 5 and 8 in. For the die block take a piece of 1¼ in. steel and shape it down to 1⅛ in. This makes a strong durable die and has long life if used in a good press. With this die block thickness an over-all length of punch of 1¾ in. works very well. Then make the punch holder 1¾ in. thick and the die shoe 2 in. thick. The holders shown in Fig. 8 are for form dies and the holes in the die shoe are for knockout pins. In a blank die there must be an opening in the die shoe and bolster to allow the blank to drop through.

Another type of unmounted blank die is shown in Fig. 9. To make this die, first machine the die block to fit the holder. Then take a thin cut over the top to get a glass smooth surface to make the layout on. Heat the die block until the top surface is a purple color and then lay out the blank in the correct position. If a jig borer is available, bore all radii possible. If there is a slotter, cut out the rest of the metal inside the lines, the slotter head being set at the desired clearance angle.

Have the slotter operator finish to the inside of the lines, then the bench man can file to fit the templet or file to the line if there is no templet. If the top ⅛ in. of the punch opening is left straight and a ½-deg. taper is used below that the original size can be maintained for a longer life and the blank will be prevented from pulling up with the punch. If the tools mentioned are not available, a row of small holes can be drilled around the inside of the line, the web between the holes cut with a hack saw or a straight punch, and the opening filed to the templet or to the layout line.

Next drill and ream the dowel and screw holes. Leave stock in the dowel holes for grinding or lapping straight and round. Drill the screw holes with a tap drill and tap 0.003 in. oversize to save trouble from distortion in hardening. The die block can then be hardened and ground top and bottom.

Machine the punch to fit the holder, grind and color the cutting end and lay out the blank outline from the hardened die block. Rough out the punch to within 0.015 to 0.030 of the outline and shear into the hard die. Finish to the sheared outline. Then finish off enough to give the required clearance. Sometimes there is material left on the punch to be stoned after hardening.

Fit the stock guides to the die. Make the width between the guides 1/32 in. greater than the high limit of the stock width. Make thickness of the guides 1/32 to 1/16 in. more than the stock thickness. Then fit a ⅜-in. thick, cold-rolled stripper on top of the stock guides. Because in this type of die the stripper does not guide the punch, there should be clearance of 1/16 in. all around. Make and attach the auto stop.

For dies with a spring stripper a formula has been developed to give the total spring pressure required. The formula was developed by trial, by putting in too few springs and then adding one at a time until satisfactory stripping was secured. The formula was developed with dies having a 5 per cent clearance between punch and die. With more clearance fewer springs would be used and with less clearance more springs. The formula is: the length of the periphery multiplied by the thickness of the stock divided by the constant 0.00117 to give the total spring pressure required. Always use one or two more springs than needed. Spring poundage is the initial tension on the springs when assembled with an initial compression of ⅛ in. Each additional ⅛ in. of compression will increase the poundage by a like amount.

Part III of *Die Design and Die Making* will appear in an early number.

## Protective Cream for the Hands

OCTAVE ANTONIO

The following formula is for a cream that will protect the hands from the dirt and grime of machine work:

½ lb. granulated gum arabic dissolved in ½ gal. hot water.

2½ lb. soap chips dissolved in ¾ gal. hot water

⅓ lb. lanolin.

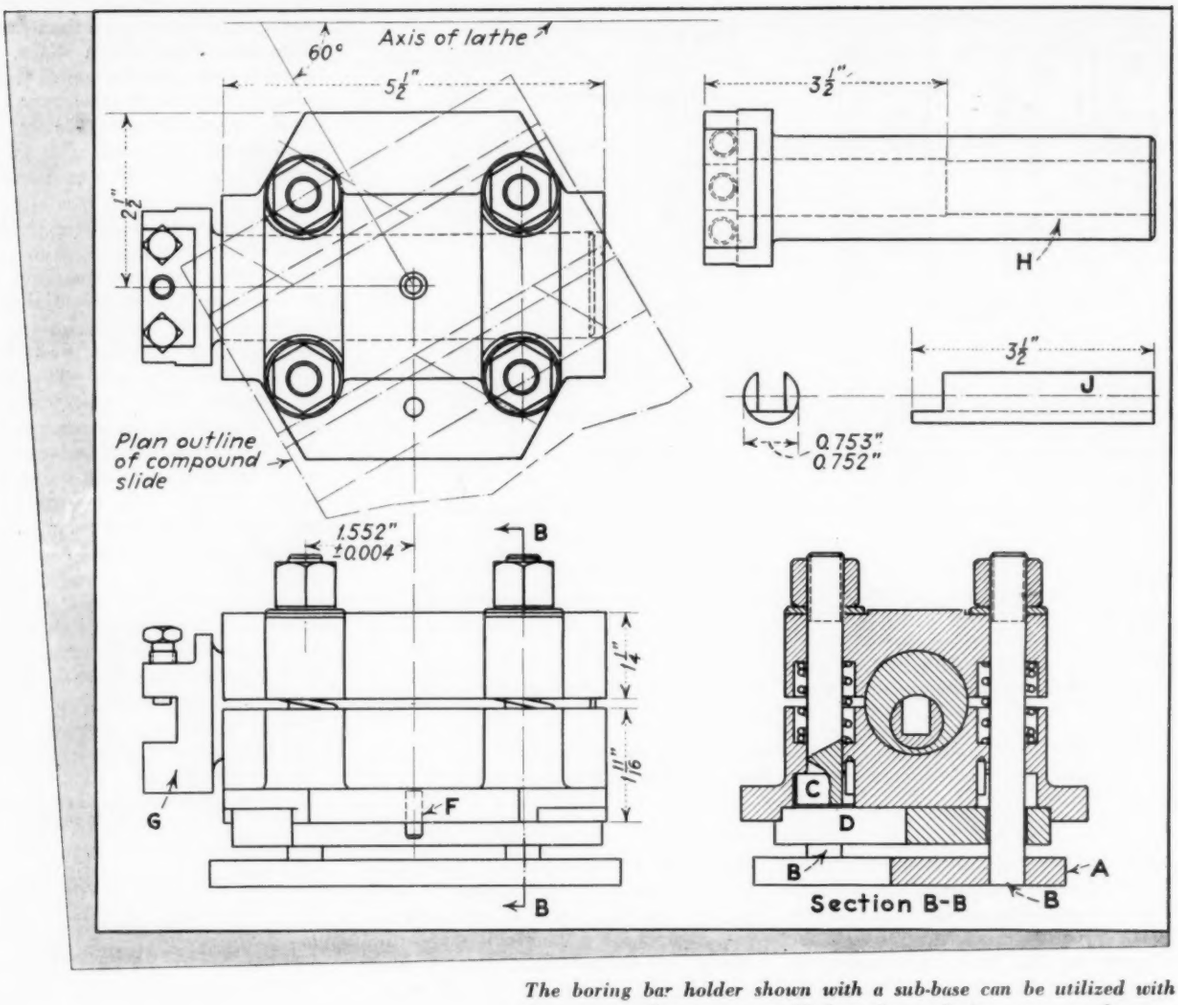
One tablespoon glycerine.

One tablespoon boric acid.

Mix the solutions of gum arabic and soap chips and work the lanolin into the slowly cooling mixture. Stir in the glycerine and boric acid and pour the whole into glass jars.

A heaping teaspoonful of the cream worked into the hands and wrists when they are clean will protect them from grime and dirt. The lanolin fills the pores and the gum arabic seals them, keeping out the dirt. The boric acid is one of the best antiseptics and will prevent cuts and scratches from becoming infected.

After work the accumulated dirt should be worked loose with the fingers, using a few drops of water. Then rinse and wash the hands. The ingredients of this formula can readily be compounded in any man's kitchen.




*The boring bar holder shown with a sub-base can be utilized with the compound rest set over 30 deg., thus reducing stress on the compound dovetail when boring, and permitting angular threading feeds*

# BAR HOLDER for the LATHE

ROLAND V. HUTCHINSON

SEVERAL of the shops in which I have worked now use the clamp type boring bar holder illustrated. Through its application appreciable savings are made on short runs and odd lots of say six pieces alike. The holder is adaptable to lathes up to 38 in. swing, but the size shown is suitable to a 16-in. machine. Cuts ¼ in. deep and a feed of $\frac{1}{16}$ in. are well within the capacity of the device.

The base of the turning toolholder has two slots at 120 deg. for a key that fits in the T-slot of the lathe compound rest. By setting over the rest 30 deg. normal to the lathe axis, two advantages are secured: (*a*) Better anchorage by reducing stress on the dovetail of the compound slide when boring; and (*b*) the use of angular feed when cutting either internal or external threads.

As shown the device is set up for turning right-hand external threads, but it can be changed to cut right-hand internal threads. A sub-assembly consisting of plate *A* has two studs *B* placed in diagonally opposite holes. When right-hand internal threads are to be cut, another sub-assembly with the studs *B* in the other pair of diagonal holes is substituted. The key *D* must be shifted to the other slot and likewise the two shouldered bolts *C* must be moved to the holes previously occupied by studs *B*. Dowel *F* merely maintains endwise location of the body of the holder with respect to the compound slide.

When the turning tool *G* is employed for short work, the customary slotted toolpost may frequently be dispensed with. This turning tool is shown in detail at *H*. The partial bushing *J* is a means of avoiding the drifting of a long oblong hole in the tool shank. Two tool positions are provided by the holder; that is, normal and parallel to the lathe axis. On much work this feature saves removing the boring bar holder.

The base of the holder is bored in place in the lathe to accommodate drill sleeves, thus avoiding holding them in the tail spindle and permitting the use of power feed in drilling. The bore size should match dimensions of existing turret lathe accessories so as to make them available as engine lathe tools.

# Editorials

AMERICAN MACHINIST ESTABLISHED 1877
VOLUME 80 NUMBER 8
K. H. CONDIT • F. H. COLVIN
EDITORS

## AND THE FLOODS CAME

FLOOD STORIES have been off the front page of the newspapers for days but the after effects of the floods are very much in evidence. Inches of mud and slime are being removed from equipment and stocks in industrial plants. Most of the equipment has come through in good shape but a fair amount of work in process and finished goods will have to be written off.

Reports from flooded plants prove the value of sealed bearings which kept out water and mud as well as the dust and grit they were designed to exclude. Hydraulic control and operating systems, of necessity inclosed, have come through practically unscathed while electrical and mechanical units have had to be dried out and overhauled.

Some companies are sure to replace damaged units that were obsolete anyway. Others, unfortunately, will not have the funds to cover replacements and may be forced out of business. A few are likely to relocate above the flood level where the fact that it has been there since the days of river borne major traffic is the only reason for a plant being where it is. Industries in the flood zone that have surpluses thank their lucky stars that they are available to repair damages. A year from now, if politics prevails, there may be none.

In the great majority of river valley plants, however, floods come every few years and the procedure to be followed when they do come is almost routine. Vulnerable parts like the motors and control units are removed and taken to a safe place until the water subsides, and all hands start automatically to clean up as soon as they can get into the shop. Aside from annoying delays such plants have suffered hardly at all.

CONGRESS, of course, has scented a luscious pork barrel in flood control appropriations. Tens of millions of tax money will undoubtedly be spent on flood control dams that will silt up in a few years and would be useless in major floods anyway. Too much reliance should not be placed on such relief measures by companies with plants in a flood zone.

"The floods came" and demonstrated once more the interdependence of human beings under our living conditions. Everything stopped when the electric power plants shut down. On the other hand modern communication facilities directed help to critical points more quickly than has ever been possible before. And modern transportation units accomplished rescue and relief work that would have been quite out of the question not so many years ago.

# Business Objects

THROUGH the voice of C. M. Chester, president of the National Association of Manufacturers, business is objecting vigorously to certain unsound principles which seem to be inherent in New Deal philosophy. It objects, for instance, to the efforts of members of the administration to prove that interests of employer and employee clash. It knows the contrary to be true because it has been proved.

It objects to being made to distribute the reserves on which it depends for development, for emergencies, for depressions. It has proved the vital need for reserves to meet each of these contingencies.

It objects to the harassing effect of constant changes in policy, of wild swings from one rosy-hued plan of political salvation to another, on the spur of the moment. It is tired of being a guinea pig, of being investigated by incompetent investigators.

No business organization would think of placing its affairs in the hands of an untried, inexperienced man. Yet that is exactly what the administration proposes when it demands that the affairs of business be put under the control of political appointees most of whom have only the vaguest notion of the technique of business management. Business is anxious to cooperate in speeding recovery, it is doing its utmost in that direction. But it objects to being held responsible for faults that really lie at the door of those who condemn it most bitterly. And it objects particularly to the constant threat of further experimental legislation, social and otherwise, which maintains a persistent damper on plans for expansion of business and reemployment of men.

# *Chips*

**WASHINGTON** — Roosevelt goes fishing as Congress struggles with tax proposals . . . Townsend plan leaders split as Congress investigation starts . . . Berry committee report demands cessation of government competition with industry . . . Business and industry spokesmen oppose surplus tax plan at hearings . . . Roosevelt continues Berry without salary as "coordinator" as he starts labor party to reelect his chief . . . Congress discovers gorgeous new pork barrel in flood control and piles up projects toward the billion mark . . . FHA extended with minor changes . . . Suggestion that Wallace produce names of farmers who have received benefits of more than $10,000 from AAA brings feeble defense that cost would be prohibitive and leads to facetious comments by Republican Senators.

**FOREIGN** — Italian stocks crash as Mussolini takes over private industry . . . Aviation expert claims modernized Italian squadrons control whole Mediterranean . . . Naval agreement signed in London, parity established for U. S. and G. B., Japan expected to go along in principle . . . Hitler refuses to accept Locarno powers' Rhineland proposal, makes a counter proposal which satisfies neither the French nor the British . . . Japanese navy leaders would curb army's continental plans . . . Martial law in Brazil . . . French seriously annoyed by actions of British cabinet in Rhine zone dispute . . . Germany tests new dirigible and sends it on first ocean crossing . . . Britain manages to get the "Queen Mary" through Clyde mud to the sea . . . Russian representative breaks off trade conference with Germany resenting Hitler speech . . . Hitler wins 99 per cent vote of confidence . . . Anti-Semitism grows in Austria . . . Universal military service proclaimed . . . Poles seize 500 in drive on Communist agitators.

**FINANCE** — Reports of 20 railroads show operating income gain of almost 50 per cent . . . Easing of European tension drives stocks upward . . . Move on foot to repeal salary publicity law . . . Treasury officials slowly recovering from shock of discovering a surplus in March.

**INDUSTRY** —Labor Disputes Act held completely unconstitutional in opinion by Judge Barnes of Chicago on Bendix case . . . Manufacturing plants in flood areas strive to repair water damage to equipment and stocks . . . Railroad executives offer six months' pay as dismissal wages for employees displaced by terminal consolidations . . . Eastern railroads ask I.C.C. to delay fare cut order . . . Lewis demands AF of L membership vote on craft unions . . . Violence marks Bantam Ball Bearing strike . . . District of Columbia Supreme Court judge refuses injunction pleas to stop Labor Board on ground of no jurisdiction.

**TRADE** —India plans to break trade agreement with Great Britain . . . Iron and steel imports up 49 per cent in 1935 . . . New York Central freight pickup plan postponed after ICC hearing at which local truck companies present vigorous protests.

**INDICATORS** — Floods drive steel production down 10 per cent but sharp recovery to new high follows . . . Electric power output up counterseasonally . . . *Business Week's* index drops a point because of flood effects.

## Indexes Turned Down in February

of both the Industrial Machinery and the Shop Supply Sales Indexes was reversed in February. For each index the final figure for January was a point or two better than the preliminary figure, and it may be that final figures for February will be somewhat better than the preliminary ones. It seems fair to assume that unusually severe weather in February with its accompaniment of traffic delays is at least partially responsible for the drop.

For comparative purposes an index of industrial payrolls has been plotted against the Industrial Machinery Index this time. The correlation between the two curves is fairly good. In each instance the average monthly index for 1935 is taken as 100, as is also the case with the Shop Supply Sales Index shown in the lower chart.

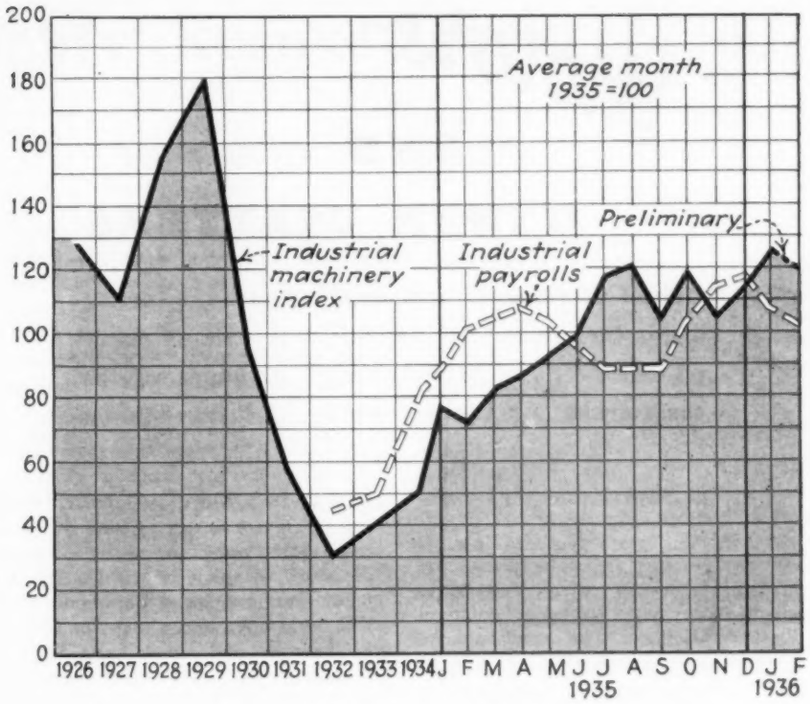
## Mechanized Industries Show Employment Gain

Although employment in all United States manufacturing industries stands at 84 per cent of 1929, employment in the country's ten newest and most highly mechanized industries is 95 per cent of the 1929 figure, a study made by the National Machine Tool Builders' Association shows.

The ten new industries, which have come into existence since 1879, include electrical machinery, apparatus and supplies; automobiles; rubber tires and inner tubes; petroleum refining; rayon and allied products; aluminum manufactures; typewriters and parts; cash registers, adding machines and calculating machines; aircraft; and radios and phonographs.

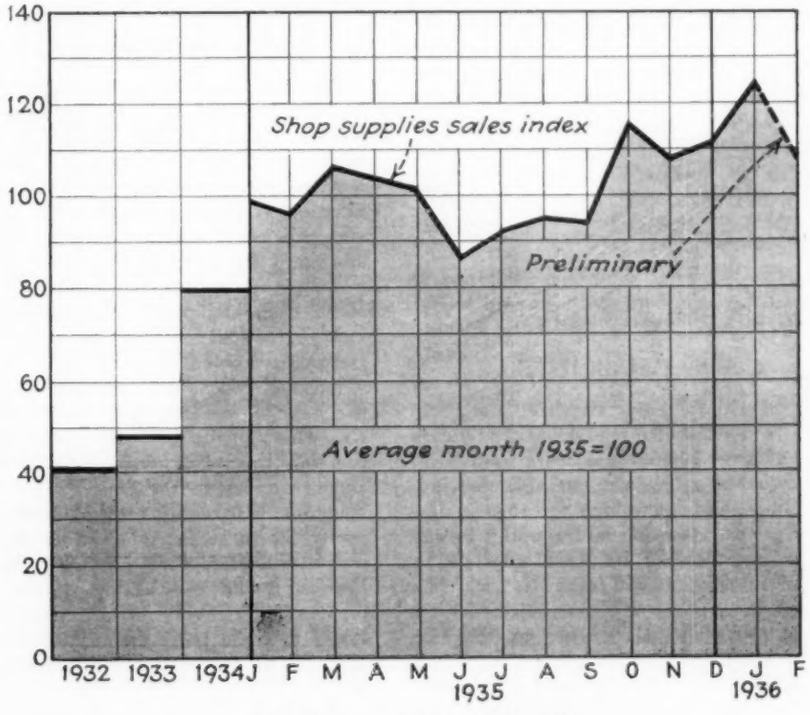
"This fact shows the vital importance of technologically-created industries in proving employment, and demonstrates unmistakably the fallacy of the superficial argument that machines cause unemployment," said Herman Lind, general manager of the association.

"These ten new industries, the most highly mechanized of all the nation's industries, now account for 13 per cent of the wage earners in all manufacturing industries of the country. In 1879 they were non-existent. In 1929, 11.6 per cent of all wage earners found employment in these ten industries, and in the six succeeding years they have increased that percentage to 13," the survey says, showing that mechanization tends to increase, rather than decrease, employment.




### Orders for Industrial Machinery

***January's preliminary figure was improved when missing factors were included to give the final picture. The preliminary estimate for February shows a drop***




### Sales of Shop Supplies

***Final calculations raised the preliminary January figure slightly but the gain was washed out by the February drop***

# Motors AND OTHER MATTERS

**Detroit sets nation's industrial tempo . . . Tooling approaches record . . . More liberal write-off policy on tools seen . . . Material changes are under way, as cast camshafts bid for acceptance . . . Piston fight on**

BURNHAM FINNEY
*Western Editor*

DETROIT — Car manufacturers are caught up in the swirl of activities which makes every spring a bedlam in Southern Michigan. The sensational rise in retail car sales the last 10 days of March gave warning of huge buying during April and May, with production totaling at least 450,000 units each month. The main job for dealers during the next 60 days is to deliver cars promptly to customers or risk losing business to competitors. Factories must keep cars rolling off assembly lines in large volumes.

Despite an abnormally cold winter and the fact that the public's initial urge to purchase new models had worn off by the end of 1935, assemblies in the first three months of this year were well over 1,000,000 units, and within 20,000 of those in the same quarter last year. Car sales spurted 20 per cent over those of a year ago. Commercial car and truck deliveries were the best for any first quarter in history. Thus Detroit again sets the country's industrial tempo.

## Why Detroit Rejoices

A few "blue ribbon" statistics: Chevrolet sold nearly 450,000 new cars and over 700,000 used cars from Nov. 2 to March 31, a remarkable showing. Buick hit a new high for 1936 in the final 10 days of last month; it has revised upward its April schedule to more than 16,000 cars; to date has produced 100,000 of its projected total of 150,000 for the current model year. Hudson and Studebaker are far ahead of last year. Chrysler dealers have had the best business since last July. Packard production and sales are soaring toward an all-time peak.

Things are beginning to happen in the tool and die trade. Fisher Body's local die department is reported working 24 hours a day; Fisher is about ready to let out a substantial chunk of die work to shops in the Detroit district. Its new Grand Rapids die plant will be in operation about June 1.

Chevrolet and Buick have awarded contracts for 1937 die work, the latter's being for front-end changes. Chrysler and Hudson haven't yet acted on their die programs. Local shops are gradually filling up with business which should keep them at or close to capacity for the next six months. It is estimated that more money is to be spent for 1937 dies than for similar programs in several years.

## Tool Buying Expanding

Machine tool buying has expanded to large proportions. Chrysler is now placing orders for the machining of engine parts at its Jefferson Avenue factory. Chevrolet has bought considerable equipment for its local gear and axle plant and is about to allot machinery for its Saginaw plant in connection with a new transmission for 1937. Chevrolet plans to move manufacture of all service parts from Detroit to Toledo.

Packard has about completed the purchase of machine tools for its new six. This car will be built in the section of the plant south of Grand Boulevard, where the One Twenty is being made, according to reliable reports. There is plenty of room there for the manufacture of both lines. Packard is said to be asking equipment makers for delivery of machines by July 15, indicating that it hopes to offer the six to the public in the early fall.

Nash is the busiest in six years and believes that it may build 75,000 cars this year, and is expected to have a sizable tooling program for next year. General Motors divisions have bought a large amount of boring machinery.

Automobile companies long have have been insistent that new machine tools pay for themselves through production savings in a very short time; in some cases one year, in others, two. Machine tool companies will be interested to know that one important maker is relaxing this rigid rule, and is beginning to buy equipment if the savings can be made in four years. This more liberal policy puts profits into plant investments rather than in federal taxes.

## Radical Material Changes

Radical changes in materials are on the way. General Motors has fought shy of using castings such as have been adopted by other companies, but next year, it is understood, Oldsmobile and possibly two other General Motors divisions will go over to cast iron camshafts as standard equipment, instead of their forged steel camshafts. Cast crankshafts may be adopted by others than Ford, but not until 1938, probably. Piston ring makers are interested in nickel alloy cast iron piston rings.

A "hot-and-heavy" fight over piston materials is pending. Ford has a cast steel piston, standard on Lincoln-Zephyrs. It is thin-walled and of about the same weight as an aluminum piston. Chevrolet recently designed one somewhat similar to Ford's, which probably will be used in 1937. To counteract this trend, Bohn Aluminum has developed an "auto-thermic" piston, incorporating a thermostat which controls piston expansion. It has been adopted by Graham-Paige.

## Few Innovations Expected

Plans for radical innovations next year appear to be fading. Numerous engine changes for more power and economy are underway. Bearings are due for some revisions by some manufacturers to correct lubricating troubles. Transmissions will be further refined. Overdrives will be even more popular.

Odds are against introduction of a rear-engined car by any volume manufacturer. The feeling is that the industry is in the midst of a lush market, which should carry over through 1937, so why go to enormous expense and take unnecessary risks to test out a new idea? Body designs will trend toward the Airflow and Zephyr types. One company is working on a plan to produce the frameless type of car such as the Lincoln-Zephyr on an economical basis.

There is much experimenting with tubular framing.

# Industries Quickly Recover from Floods

## Output and Shipments Rapidly Continued As Cleaning is Finished

With amazing rapidity, metal working plants affected by the recent floods in New England, Pennsylvania, upper New York and other Eastern states, have repaired the damage and most of them are already back to regular production schedules. The best available estimates indicate that about $32,-500,000 has been lost by factories, or upwards of 13 per cent of the total estimated loss of a quarter of a billion dollars. Earlier estimates of two and three times this amount have been scaled down as more careful investigations have been made.

Because floods are not uncommon in many of the New England and other industrial centers, experience has taught manufacturers how to prevent much of the damage, and rehabilitation with them has become a matter of course. The severity of this flood did, however, tie up railroads and delay shipments until machinery could be cleaned, refinished and shipped.

Electrical equipment probably suffered the greatest damage because coils are difficult to dry properly without injuring the insulation. Because of their delicate construction, control devices suffered more damage than motors. Early estimates from the Pittsburgh area indicated that between 35,000 and 50,000 electrical control devices were submerged, some 100,000 motors were damaged, and from 1,000 to 3,000 electrical instruments suffered.

Miles of belting was submerged, much of which will have to be replaced either at once or soon.

Excessive flood insurance rates precluded very much of this type of protection, and some of the smaller manufacturing plants may never reopen unless reorganized with new capital.

### Pittsburgh Area

Reports of the flood at Pittsburgh were among the most dramatic. With telephone, telegraph and mail service suspended for several days, radio reports were all that were available during the dark hours when families were separated and thousands were marooned in offices and hotels in the downtown area. Martial law was declared at once to protect property.

Fortunately, steel plants are above the high-water and most of the mills were able to maintain their delivery schedules as soon as railroads had been put back into service. However, damage to machinery in many manufacturing plants was severe, not only in Pittsburgh but in the adjacent manufacturing area. Warehouses with motors undamaged by the flood made quick delivery of every unit available, and replacement parts, coils and wire were in great demand.

The fight against rust and corrosion began as soon as men in hip boots could get to the machinery, and many plants were able to provide emergency electrical current from their own power houses as soon as they were able to clean boiler tubes, generators and other equipment.

Fire added to the horror of the flood, as gasoline storage tanks and supply lines broke, covering the raging water with seething flames.

Pittsburgh machine tool dealers were able to meet quickly the emergency with an announcement that they were able to make immediate deliveries of machinery and equipment as soon as the water receded.

### New England

Dikes, for many years protection against the Spring freshets of the Connecticut river and tributaries, gave way in some sections, but more often proved to be too low this time. Water rose beyond the second floor in some plants, and inspection of damage during the height of the flood was made in row boats, in many instances.

In this area, as throughout the whole flood terrain, homes and stores were the worst sufferers, however. Finished stocks of perishable goods were lost by some factories, but refinishing saved a great deal of metal products.

### Ohio-West Virginia Area

Although given several days' warning, the height of the flood level and its duration crippled many of the low-lying plants at Wheeling, and kept some of them submerged for as long as 48 hours. However, most of the perishable stock was moved to safety.

Steel strips were welded to steel doors of the West Virginia plant of the Ohio Power Co., and bulkheads were built to protect the wooden doors. About 150 men were marooned in the plant and kept the power going, while pumps kept the seepage from interfering.

Again, it appears that many of the smaller plants will be forced to go out of business unless new capital comes to the rescue.

### Upper New York

Corning, Elmira and Binghamton, and to a less extent Ithaca, Syracuse, Canandaigua, Watkins Glen, Albany and Kingston, suffered the immediate effects of heavy rains.

As in other areas, electrical equipment suffered the worst damage as far as the industrial plants were concerned. Heaviest losses were sustained by highways and other communication services, but the duration of the peak was relatively short.

### WANTED: Supplies

A comprehensive survey, based on telegraphic reports of field men of the McGraw-Hill Publishing Co. in the several flood areas, shows the kinds of equipment in heavy demand for factory reconditioning and repairs. Some of the items follow:

Asbestos pipe-covering material
Bearings
Belting (leather and rubber)
Brake-lining
Building materials
Bushings
Chain hoists
Circuit breakers
Cleaning compounds
Conduit (both pneumatic and electric)
Construction Machinery
Emery cloth
Flexible machines and hand power tools
Fuses
Gasoline and oil engines
Gears
Instruments
Machine tool parts
Material handling equipment
Metal paint
Metal polish
Meters (gas, electric, and water)
Mill supplies
Motor-control equipment
Motor repair parts
Motors
Office machines, equipment and supplies
Oils for production equipment
Packing and gaskets
Paint
Power generation equipment
Precision tools, gages
Pumps
Rheostats and resistances
Rubber hose
Sectional pipe and culverts
Sheet metal (all types)
Shovels, brooms, mops
Small tools
Steel wool
Switchboard equipment
Tool steel
Waste
Water purifiers
Welding rods and wire
Wire

*"For Automotive Research."*

C. F. KETTERING

## N.L.R.B. LOSES

**Bendix Wins First Step in Company Union Test Case**

Judge John T. Barnes, on March 24 declared the National Labor Relations Act unconstitutional in its entirety. This decision was given in a suit brought on Feb. 1 by the Bendix Products Corp., South Bend, Ind., a subsidiary of the Bendix Aviation Corp., to restrain the Federal Labor Relations Board from interfering with "the business of the corporation."

The company petitioned for an injunction restraining the board from holding an election to determine whether the union affiliated with the A. F. of L., or the Bendix Employee Association should bargain for Bendix workers. Both unions contended that they represented a majority in the plant.

The company contended that interstate commerce was affected only indirectly in the controversy and that the board, therefore, had no jurisdiction in the case.

## NEW CONCERN FORMED

**Bridgeport Thermostat Co. Buys Division of Bridgeport Brass Co.**

Bridgeport Thermostat Co., capitalized at $750,000, has bought the Bridgeport Brass Co. thermostat and bellows division. The new company began operations when directors approved purchase of an independent plant.

W. F. MacDonald, chief engineer, and W. J. Van Harten, of the brass company, will be the executive officers of the new concern, which will employ approximately 500 men.

The Franklin Institute of the State of Pennsylvania will award the Franklin Medal to FRANK BALDWIN JEWETT, Ph. D., D. Sc., D. Eng., Ll. D., vice-president of the American Telephone & Telegraph Co., and president and director of the Bell Telephone Laboratories, New York, N. Y., and to CHARLES FRANKLIN KETTERING, Hon. D. Eng., D. Sc., vice-president General Motors Corp., and general director, General Motors Research Laboratories, Detroit Mich., on May 20 at Philadelphia, Pa.

The medal is awarded annually from the Franklin Medal Fund, founded in 1914 by Samuel Insull, "to those workers in physical science and technology, without regard to country, whose efforts, in the opinion of the Institute, have done most to advance a knowledge of physical science or its applications." Dr. Jewett, a recognized leader in his field, has often been honored by technical societies both here and abroad. Mr. Kettering, widely known as a leading manufacturing executive, is a past-president of the Society of Automotive Engineers, Inc.

## TOLEDO SHOPS BUSY

**Dollar Volume of Business Shows Gain; Industrial Outlook is Bright**

Dollar volume of business in Toledo is 34 per cent greater than a year ago, as many large industries are reporting business gains. National Supply Co., oil well machinery manufacturers, reported net profit of $670,000 for 1935, as against a net loss of $121,000 the previous year, and many of the large tool and metal working plants have shown gains. Recently Champion Spark Plug Co. received an order for 3,000,000 plugs annually from Chrysler Corp. City Auto Stamping Co. reported its die division booked to capacity until September, indicating design changes for the 1937 cars. Many other Toledo concerns report increased sales and inquiries, and a bright outlook.

## ZENITH EXPANDS

**New Lease, Plans for Own Building to Increase Floor Space**

Zenith Radio Corp. has leased about 100,000 additional square feet of floor space for added plant capacity for the next year. It now occupies more than 250,000 sq. ft. of leased space.

The company is negotiating for the purchase of a piece of vacant property on which it proposes to erect its own plant this summer. Plans being drawn for the new plant call for considerably more floor space.

*"For Telephony Research."*

F. B. JEWETT

## BUYS $24,510,000 TOOLS

**General Motors Shows $75,000,000 in Plant Improvement in 1935**

During 1935, General Motors Corp. spent $24,510,000 for special tools, dies and other equipment, beside $51,160,000 for other plant improvements, the annual report of the corporation shows, stating that $23,720,000 of the tooling costs had been charged off to operating expense. Net 1935 earnings of the corporation were $167,226,510, as compared with a net of $94,769,131 for 1934.

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General Motors Corp. will soon spend $200,000 on its Packard Electric Co. plant, Warren, Ohio, for new equipment and buildings, according to William S. Knudsen, executive vice-president.

## OPENS NEW PLANT

**Michigan Tool Co. to Devote Wing to Making Special Tools**

For the second time in five years, Michigan Tool Co., 7171 East McNichols Rd., Detroit, Mich., has expanded its manufacturing facilities to handle increased business and for broadening of the company's line. The present expansion, a 20,000 square foot wing to the main plant, has been equipped and tooled to manufacture special machinery.

## AIR CONDITIONING

As reported by 98 manufacturers of air conditioning systems and units orders booked during January amounted to $2,313,534, the Department of Commerce reports in announcing a new series of monthly statistics for this industry.

# Industry Offers A 7-Point Program To Cut Unemployment, Speed Recovery

Industry, as represented by the National Association of Manufacturers, offered a plan to cut unemployment, its directors announced in New York, N. Y,. on March 25. Stating that manufacturers' payrolls carry only 2,000,000 less names than the 1929 maximum, the Association said that obviously industry cannot be expected to provide work for all of the 9.000,000 estimated to be out of work at present.

"Taken as a whole," the statement said, "manufacturers throughout the depression have carried employment in continuous excess of ability to market their respective products, and have privately incurred debts and deficits to do so. Corporate surpluses have been decreased by more than $7,000,000,000, much of which went into employment and maintenance."

"Industry has been singled out for overwhelming taxation, been made the constant subject of restrictive, costly and injurious legislative experiments, and has been berated because its normal speed has lessened as its pathway was obstructed with political experiments."

If the forces of recovery are released, the statement said, there will be from 50 to 80 billions of dollars of "stored up expansion." These sources would be encouraged by the recognition of these seven points:

"1. That an accurate knowledge of the extent and character of unemployment is essential as a basis to practical discussion, and the manufacturing industry would gladly cooperate in obtaining such an authoritative census.

"2. That the chief pools of unemployment lie in the durable goods and particularly the construction industries, and the service industries depend upon them, and that the financing of efforts herein requires long term investment based upon confidence in the future.

"3. That prosperous industry is the cause of expanding employment and the source of reliable and enlarged public revenue.

"4. That neither an individual nor a business can employ at continuing loss nor unduly increase operating cost without jeopardizing through bankruptcy the employment of those now employed.

"5. That expanding government competition with private industry is not only a deterrent to expansion of private employment, but is accompanied by methods of competition which government itself prohibits as between private competitors.

"6. That expansion of private enterprise would be encouraged by the curtailment of governmental extravagance, which clouds the future with burdensome taxes.

"7. That the importation of foreign goods and rejected ideas affect injuriously American employment and adulterate American concepts of social and political life."

## R. W. Burk Heads Sales For Kearney & Trecker

Ralph W. Burk has been appointed sales manager of Kearney & Trecker Corp., 6784 West National Ave., Milwaukee, Wis., succeeding George L. Erwin, Jr., resigned. Mr. Burk has been in the machine tool business since 1917, and for the past ten years has been associated with Kearney & Trecker Corp. as salesman, branch manager, Western manager and assistant sales manager. George E. Gustafson is service manager, the company announced.

## WIDELY SCATTERED

Although the automobile industry is concentrated around Detroit and other Michigan cities, more than a quarter of the employment in car and truck plants is outside of Michigan and is distributed throughout 28 states from coast to coast and from the Canadian to the Mexican borders, according to a survey just completed by the Automobile Manufacturers Association, New York, N. Y.

# Industrial Review

• REPORTS from more than a dozen important industrial centers agree that the machinery and machine tool business during the first quarter of 1936 was reasonably satisfactory. Flooded areas are rapidly returning to normal as factories repair water damage which seems to have been concentrated largely on motors and other electrical equipment.

• NEW ENGLAND looks for very little machine tool replacement business as a direct result of floods in that region. There is still considerable business pending from regular sources although March as a whole was not as good as January and February. The New York district reports good business and the prospects for further improvement. Philadelphia says that both inquiries and orders have dropped off slightly during the last few weeks. In this territory the result of the floods seems to have been a delay in placing equipment orders. Pittsburgh plants are hard at work repairing flood damage and are approaching normal rapidly.

• WHILE GENERAL BUSINESS in Cleveland is moving steadily upward, orders for machine tools and machinery have been decidedly spotty during the past month. A week of unusually good business is followed by several of comparative dullness. The labor situation is quiet. Interest in machinery purchases is reviving in Detroit after some weeks of quiet. 1937 programs of the automobile companies are in process of formation and should lead to extensive buying. The tool and die shops have taken a number of orders in the last few days. Here, too, the labor situation is quiet. Toledo reports steady improvement in interest and orders for equipment. All signs point to a busier season ahead with no labor troubles on the horizon.

• CINCINNATI was very little affected by the flood industrially, and although inquiries have dropped somewhat there is every expectation of active business during the spring. March was relatively satisfactory in St. Louis as business continues to run along on a fairly even keel. The general level of activity here is not as high, however, as it is in some other centers. Chicago reports an excellent first quarter of machine-tool business with March bookings up and prospects for April exceptionally good. The consensus of opinion is that this condition will prevail at least until midsummer. Labor trouble is practically non-existent. About the same situation holds in Milwaukee where the trend is upward and unfavorable conditions are scarce.

# Watching Washington

**Congress begins to see why Roosevelt left tax details out . . . Defense appropriation at peace time high . . . Berry publishes reports of his committees and keeps his job**

WASHINGTON—As Congressional committeemen struggle with the President's proposal to tax corporation surpluses to pay the bonus and the AAA obligations, as well as a few other little bills, it becomes increasingly clear why he was so genially indefinite about the details. If the average citizen did not have to pay the check, regardless of whose ideas prevail, he might get something of a laugh at the tribulations of those members of Congress who so blithely passed the bonus bill a few weeks ago. But he is between hell and high water no matter what sort of tax is finally decided upon, because neither party at interest shows the slightest inclination to cut expenses and thereby lower taxes.

### Tax Hearings Are Over

Business had a hearing before the Ways and Means Committee and stated its case as forcefully as it could. But the attention it got from the Committee was painfully perfunctory, as might have been expected from a group that had just heard Commissioner Helvering of the Treasury prove that the proposed tax was sure to fall short of the requirements. The only bright spot for business witnesses came when a Communist witness indorsed the whole tax program of the President to the obvious embarrassment of the Democratic members and the delighted guffaws of their Republican colleagues.

Since the tax bill was proposed, the Administration has learned that what seems right in theory works out very differently in practice. The idea was not only to tax the surpluses of large corporations but to raise more revenue without disturbing the great body of taxpayers.

Members of Congress have been hearing from their districts about specific instances of the effect of the surplus tax. They are learning that under the tax as originally proposed many corporations would be forced into bankruptcy. They would have commitments that would have to be met and would have to pay the tax besides. Some provision will have to be made for the payment of debt. If all the exceptions were made to take care of such situations, the yield probably would be less than the present tax.

### Peace vs. Business Loss

A $600,000,000 War Department apropriation bill when coupled with a Navy bill of about the same amount is seen as evidence that neither the executive nor the legislative branch of government has any great faith in keeping out of war if Europe should decide to settle some of its differences that way.

While some deductions must be made for the non-military items in these appropriation bills they represent the largest total ever voted for national defense in peace time. In the matter of preparedness significance also is attached to the growth of airplane manufacturing capacity. Existing commercial planes have military value. By design and by the natural growth of the airplane and automotive industries the United States is being put on a stronger war footing than the authorities on the subject will admit. In official quarters it is realized that the solicitude for peace on the part of the American people will not stand any great amount of business loss.

### N.R.A. in Cold Storage?

Berry's committees produced some reports last week, some unanimous, some not. Most of the recommendations were harmless enough and far from novel. In the meantime Major Berry started a "nonpartisan" labor league to reelect Roosevelt, and the President continued the Major in his job as coordinator, without salary. Some people think that this move keeps NRA in ice until after election at which time it may be warmed up and started going again.

### *A.G.M.A. Speaker*

JOHN W. O'LEARY

## GEAR MEN TO MEET

### Two-Day Annual Meeting Program Announced by A.G.M.A.

Seven technical papers and three general sessions are planned for the annual meeting of the American Gear Manufacturers Association, April 20 and 21, Adelphi Hotel, Philadelphia, Pa., B. F. Waterman, chairman of the program committee, announced.

John W. O'Leary, president, Machinery and Allied Products Institute, will address the meeting on industrial problems at the opening session. Others papers will be:

"What's Ahead in Sales," by F. B. Heitkamp, American Type Founders Co.: "Gear Noise—Causes and Corrections," by W. E. Sykes, Farrel-Birmingham Co., Inc.: "Gear Cost Estimating," by G. R. Holbrook, Chas. E. Crofoot Gear Corp.; "Marine Gearing," by Ira Short, Westinghouse Elec. & Mfg. Co.; "Cast Steel and Welded Plate Combination Gear Housings," by Everett Chapman, Lukenweld, Inc.; "A Standard Procedure in Determining the Size and Horsepower Capacities of Gears of Different Materials," by G. E. Katzenmeyer, National-Erie Corp. and "The Use of Tapered Roller Bearings in Gear Reduction Units, by S. M. Weckstein, Timken Roller Bearing Co.

J. C. McQuiston, Penn Lincoln Hotel, Wilkinsburg, Pa., is manager-secretary.

*Heads Link-Belt*

ALFRED KAUFFMANN

ALFRED KAUFFMANN has been elected president of Link-Belt Co., 307 North Michigan Ave., Chicago, Ill., succeeding George P. Torrence who resigned. Mr. Kauffmann started with the company 35 years ago as a draftsman. He was successively design engineer, superintendent of construction, sales engineer, vice-president and manager of the Philadelphia plant, vice-president in charge of the Dodge and Ewart plants in Indianapolis, and for the past four years has been first vice-president of the Chicago plant's operations. He has been a director of the company since 1922.

# PERSONALS

T. E. MCFALL has been elected president of the Muskegon Piston Ring Co., Muskegon, Mich., with which the Sparta Foundry Co. has been merged. JOHN E. JOHNSON has been made vice-president in charge of the Muskegon division and HAROLD G. VAUGHAN vice-president in charge of the Sparta division.

A. M. LOFLAND has been elected president of the Indestructible Wheel Co. Inc., Lebanon, Ind., recently organized to take over and continue operation of a wheel manufacturing business in that city operated for the past 26 years by Mr. Lofland. Other officers are HARRY L. LENOX, vice-president, and WILL C. DAVIS, secretary-treasurer.

ALBERT B. HOFFMAN, formerly chairman of the Detroit Sulphite Pulp & Paper Co., has been elected president of the Blackmer Rotary Pump Co., Grand Rapids, Mich.

*Kelvinator Works Manager*

G. V. POLLARD

G. V. POLLARD has been named general works manager of Kelvinator Corp., Detroit, Mich., and will have charge of manufacturing operations at Detroit and Grand Rapids. He has been director of quality for the company since 1928. Previously he had been a divisional superintendent for Chrysler Corp. for seven years, and a superintendent for Budd Wheel Co. for two years.

Dr. HEINRICH RIES will be awarded the Joseph S. Seaman Medal and DAVID MCLAIN will receive the J. H. Whiting Medal of the American Foundrymen's Association during the organization's annual meeting in Detroit, Mich., during the week of May 5. Dr. Reis, head of the geology department at Cornell University, will be given the award for his outstanding work in research, and Mr. McLain for his contributions stimulating better melting practices.

H. L. PIERSON, formerly president of the Detroit Motor Valve Co., has been elected to the board of the Eaton Mfg. Co., automotive parts manufacturing concern, Cleveland, Ohio. The Detroit company was recently acquired by the Eaton concern.

# BUSINESS ITEMS

Reliance Electric & Engineering Corp., Cleveland, Ohio, has appointed Philip A. Singleton, Philadelphia, and Jack K. Williams, Chicago to its sales force.

Foote Bros. Gear & Machine Corp., Chicago, Ill., has appointed H. S. Thayer, 136 Milnor Ave., Syracuse, N. Y., representative for that territory.

Bantam Ball Bearing Co., South Bend, Ind., has named R. A. Griswold to handle its Connecticut and Massachusetts territory, with headquarters in Hartford. Long identified with the anti-friction bearing industry, Mr. Griswold has been with the Rivett Lathe & Grinder Co., Van Norman Machine Corp., and the New Departure Mfg. Co. in sales promotion work.

Buffalo Machine Co., Inc., 841 Grant St., Buffalo, N. Y. has been organized by Joseph M. O'Connell, president, and Dan B. Symonds, for eight years Buffalo manager of Simmons Machine Tool Co., Albany, N. Y., and with the Iroquois Machine Corp., Buffalo, for five years. Mr. O'Connell severed his connection with the Simmons Machine Tool Co., after eighteen years. Mr. Symonds is vice-president and treasurer of the new company, which will sell and rebuild machine tools of all kinds.

Harnischfeger Corp., Milwaukee, Wis., has named E. T. Bennington a member of its Chicago, Ill., sales staff as engineer.

*With Type Founders*

FRED B. HEITKAMP

FRED B. HEITKAMP former general sales manager, Cincinnati Milling Machine Co., and who recently resigned as vice-president and general manager of Lyon Metal Products Co., Aurora, Ill., has been appointed assistant general sales manager of American Type Founders Sales Corp., Elizabeth, N. J. Harry W. Alexander, general sales manager, continues in charge of sales for the entire company.

# S.A.E. Production Meeting Program Includes Sessions at Detroit Plants

The Production Engineering Activity of the Society of Automotive Engineers has scheduled the 1936 S.A.E. Production Meeting to be held in Detroit, April 21 to 24. It will be a combination of technical sessions and tours through several of the most interesting production plants in the automotive center. Technical sessions are scheduled at several plants, affording an opportunity to discuss materials and processes.

K. L. Herrmann, Bantam Ball Bearing Co., a vice-president of the Society, is chairman of the production engineering activity, and V. P. Rumely, Hudson Motor Car Co., a past vice-president, is vice-chairman. W. B. Hurley, Detroit Edison Co., is chairman of the meeting, and D. S. Devor, General Spring Bumper Co., P. W. Fassler, Fassler Welding Machine Co.; Joseph Geschelin, Chilton Co.; R. R. Keith, J. I. Case Co.; W. H. McCoy, General Motors Corp.; Mr. Rumely and D. A. Wallace, vice-president, Chrysler Corp., constitute the program committee.

Alloy cast-iron crankshafts and camshafts will be discussed on April 21, when K. L. Herrmann will preside. W. F. Pioch, Ford Motor Co., will describe the designing, casting and machining of the Ford V-8 crankshaft. A. K. Antonsen, Fairbanks Morse & Co., will discuss cast crankshafts for large diesel engines. D. A. Vail, Campbell, Wyant & Cannon Foundry Co., will discuss casting and machining cast alloy camshafts.

W. H. McCoy, General Motors Corp., Experimental Production Machine Shop will preside at the balancing session that evening. S. T. Foresman, Chrysler Corp., will give a paper on the influences that proper balancing have on the design and building of today's automobile. E. J. Wolff, General Motors Corp. Research Division, will discuss the balancing practices developed in production by his company.

On April 22 a tour of the new Great Lakes Steel Co. plant is planned followed at the plant by a technical session under Mr. Rumely. E. L. Wetstein and Julius Klauss of the Steel company will discuss steels for use in the automotive industry.

The machining session in the evening will be presided over by F. W. Cederleaf, Ex-Cell-O Aircraft & Tool Corp. R. N. Brown, Packard Motor Car Co., will tell all about the tooling for the Packard 120 cylinder blocks and Joseph Wells, Pontiac Motor Co., will discuss the requirements in modern cutting tools.

The afternoon of April 23 will be devoted to a tour of the Aluminum Co. of America's plant, when Mr. Wallace will preside at a session at the plant, and will give a description of the designing and manufacturing problems of Chrysler elliptical skirted pistons. The production dinner will be held in the evening with the Detroit section as hosts.

The morning of April 24 will be devoted to a conducted visit to Greenfield Village and the Ford Museum. The meeting will tour the foundry and glass works, and R. H. McCarroll, Ford Motor Co., will tell about the manufacture of safety glass. J. E. Padgett, Spicer Mfg. Corp., will preside.

## Exports of Machinery During February, 1936

| | February 1936 | December 1936 | February 1935 |
|---|---|---|---|
| Electrical machinery and apparatus | $6,169,236 | $6,037,034 | $5,206,548 |
| Power generating machinery (except automotive and electric) | 630,555 | 937,519 | 570,995 |
| Construction and conveying machinery | 520,511 | 660,934 | 479,274 |
| Mining, well and pumping machinery | 2,780,007 | 2,668,095 | 2,108,730 |
| Power-driven, metal-working machinery | 3,834,019 | 3,947,706 | 1,606,608 |
| Other metal working machinery | 471,815 | 729,901 | 155,688 |
| Textile machinery | 848,753 | 1,488,229 | 422,644 |

## Exports of Metal-Working Machinery During February, 1936

| | February 1936 | January 1936 | February 1935 |
|---|---|---|---|
| Engine lathes | $395,467 | $291,299 | $40,236 |
| Turret lathes | 112,217 | 110,122 | 77,624 |
| Other lathes | 96,728 | 151,839 | 39,445 |
| Vertical boring mills and chucking machines | 232,506 | 139,865 | 67,250 |
| Thread cutting and automatic screw machines | 195,451 | 191,721 | 76,120 |
| Knee and column type milling machines | 111,952 | 72,590 | 67,963 |
| Other milling machines | 241,380 | 251,517 | 101,852 |
| Gear cutting machines | 255,368 | 330,432 | 66,468 |
| Vertical drilling machines | 76,674 | 58,883 | 11,890 |
| Radial drilling machines | 11,100 | 20,670 | 10,500 |
| Other drilling machines | 101,116 | 109,640 | 66,521 |
| Planers and shapers | 31,596 | 83,703 | 18,604 |
| Surface grinding machines | 109,422 | 115,214 | 37,757 |
| External cylindrical grinding machines | 131,362 | 176,886 | 57,892 |
| Internal grinding machines | 95,452 | 154,543 | 80,073 |
| Tool grinding, cutter grinding, and universal grinding machines | 137,719 | 194,202 | 167,606 |
| Other metal grinding machines | 61,191 | 67,908 | 18,791 |
| Sheet and plate metal working machines | 215,842 | 111,825 | 81,082 |
| Forging machinery | 152,901 | 285,726 | 125,422 |
| Rolling mill machinery | 358,726 | 160,940 | 141,688 |
| Foundry and molding equipment | 349,218 | 556,093 | 57,222 |
| Other power driven metal-working machinery and parts | 360,631 | 312,088 | 194,652 |
| **Other Metal-Working Machinery** | | | |
| Pneumatic portable tools | 55,745 | 51,346 | 52,394 |
| Other portable and hand or foot operated metal-working machines and parts | 60,946 | 51,001 | 46,852 |
| Chucks for machine tools | 17,495 | 12,661 | 11,612 |
| Machine operated pipe and thread cutters, stocks, dies, taps and other machine-operated cutting tools | 279,211 | 569,906 | 26,267 |
| Other metal-working machine tools | 58,418 | 44,987 | 18,563 |

# OBITUARIES

EDWARD W. CURTIS, 74, president and general manager, Curtis Machine Corp., Jamestown, N. Y., died March 25. With his three brothers, all deceased, he organized the company in 1890.

RAYMOND DILL, for the past thirteen years treasurer of the Allis-Chalmers Mfg Co., Milwaukee, Wis., died in his office on March 17. Born 55 years ago, he joined the company in 1905, after four years with Westinghouse Electric Co., and in 1923 he was elected treasurer.

FRANK W. KANTER, 56, president of Walter Machine Screw Co., Detroit, Mich., died March 12 at the age of 56.

ROLLIN CARROLL WELCH LEWIS, 87, who retired, in 1922, as superintendent of the bank and lock department, Yale & Towne Mfg. Co., Stamford, Conn., died on March 23. He introduced many safety devices for power presses. He had been with the company for 38 years.

CHARLES S. LOCKWOOD, 85, cofounder and formerly consulting engineer of the Hyatt Roller Bearing Co., division of General Motors Corp., Harrison, N. J., died March 20. He had been with Hyatt for 61 years, and had assigned more than 100 patents to the company.

FRANK J. SHERMAN, until two years ago president of Atlas Drop Forge Co., Lansing, Mich., died March 23 at the age of 66.

## Metal Industry Pioneers In Prefabricated Houses

Scores of companies long prominent in the machinery and metal working industries have seriously turned their attention to prefabricated homes, looking toward the predicted revival in residential construction for new sources of profit.

Steel, copper, aluminum and alloys, and a wide range of plastic materials, are being used experimentally as well as in actual construction as "substitutes" for the more commonly used building materials.

Included in the ever increasing list of metal working concerns interested in pioneering a new type of home are Harnischfeger Corp., Milwaukee, Wis.; Hobart Brothers, Troy, Ohio; General Electric Co.; American Rolling Mill Co., Middletown, Ohio; Republic Steel's subsidiary, Berger Mfg. Co., Canton, Ohio; Lincoln Steel Products Co., New York; Reynolds Metal Co., New York, N. Y.; Kelsey Hayes' subsidiary, Stran-Steel Corp., Detroit, Mich.; Columbia Steel Tank Co., Kansas City, Mo.; Martin-Parry Corp., York, Pa.; Edward G. Budd Mfg. Co., Philadelphia, Pa.; Ferrocon Corp., Philadelphia, Pa., organized by a group of metal manufacturing executives; Soulé Steel Co., San Francisco, Calif.; and Kennecott Copper Co., New York, N. Y., which has organized a subsidiary to build prefabricated homes.

*A.M.A. Toastmaster*

CHARLES J. STILWELL

## MASS PRODUCTION

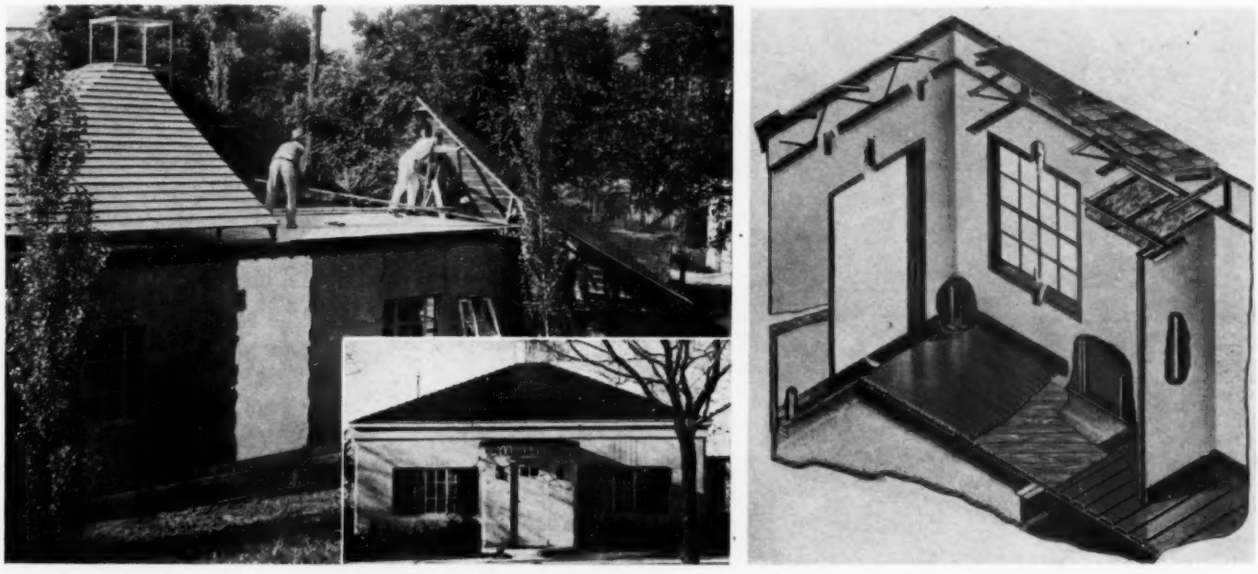
### Management Association Plans Conference on Today's Manufacturing Problems

Manufacturing executives from every part of the country will attend the production conference of the American Management Association, April 16-17, in Hotel Statler, Cleveland, reservations reported by Alvin E. Dodd, executive vice-president, 330 West 42nd St., New York, N. Y., indicate.

Changing plant operations from a depression to a production basis will be the central theme of the discussions. The program was based upon a survey made by the Association's vice-presidents in charge of the two production divisions. Modernizing equipment, and rebuilding the working and supervising forces in plants were shown to be the most important jobs challenging manufacturing executives today.

Session chairmen and speakers representing metal-working interests include Charles J. Stilwell, vice-president, Warner & Swasey Co., Cleveland, Ohio; C. D. Barr, president, American Cast Iron Pipe Co., James M. Talbot, factory manager, White Manufacturing Co., Oscar Grothe, vice-president, White Sewing Machine Corp., Raymond S. Perry, vice-president, Ingersoll Milling Machine Co., F. J. Van Poppelen, industrial engineer, Remington Arms Co. Ralph F. Cohn, factory manager and secretary Reynolds Wire Co., Major Albert Sobey, director, General Motors Institute, J. Carlton Ward, assistant general manager, Pratt & Whitney Aircraft Corp., Frank Klein, Worthington Pump & Machinery Corp., and R. A. McCarty, manager, generator division, Westinghouse Electric & Mfg. Co.

Mr. Stilwell will preside at the banquet, Thursday evening, and C. D. Barr, vice-president of the American Cast Iron Pipe Co. will be the speaker, it has been announced.



*Up She Goes*—A three-man crew can assemble an arc-welded Hobart Bros. home in five days, the Troy, Ohio, machinery manufacturer, who has expanded into the prefabricated residence business, says of his product shown at the left. Insert shows the front elevation; five rooms, erected, for $3,300. Right—Harnischfeger Corp., Milwaukee, Wis., shows structural details of its house, costing $4,000, erected. Flooring is supported by steel members and decking; wall, floor, ceiling and roof sections prefabricated at the factory. Hip or flat roof styles available.

| Company | 1935 Earnings | 1934 Earnings |
|---|---|---|
| Addressograph-Multigraph Corp | $829,755 | $465,829 |
| Allis-Chalmers Mfg. Co | 1,985,137 | d1,039,406 |
| American Chain Co | 1,645,809 | 491,875 |
| American Radiator & Standard Sanitary Corp | 2,798,860 | 1,455,227 |
| Art Metal Construction Co | 259,147 | d71,970 |
| Atlas Imperial Diesel Engine Co | 36,885 | d30,411 |
| Autocar Co | d164,812 | d139,741 |
| Bendix Aviation Corp | 3,163,921 | 1,903,120 |
| Bethlehem Foundry & Machine Co | 4,195 | d24,666 |
| Boeing Airplane Co | 333,799 | ..... |
| Borg-Warner Corp | 6,982,732 | 3,750,576 |
| Bridgeport Brass Co | 726,617 | 576,636 |
| Budd (Edward G.) Mfg. Co | 743,412 | d1,398,833 |
| Budd Wheel Co | 784,444 | 111,944 |
| Bullard Co | 294,003 | 111,443 |
| Canadian Locomotive Co., Ltd | 95,130 | 55,520 |
| Carrier Corp | d335,063 | d86,582 |
| Chicago Pneumatic Tool Co | 729,999 | 412,623 |
| Consolidated Aircraft Corp | 332,731 | 574,400 |
| Crosley Radio Corp. (9 months) | 469,675 | 578,477 |
| Curtiss-Wright Corp | 2,886 | 359,736 |
| Cleveland Graphite Bronze Co | 1,273,117 | 510,803 |
| Dictaphone Corp | 561,463 | 391,282 |
| Driver-Harris Co | 245,496 | 138,806 |
| Eisler Electric Corp | 51,461 | 19,562 |
| Electric Boat Co | 73,466 | 339,948 |
| Electric Household Utilities Corp | 342,546 | 483,356 |
| Electric Products Consolidated | 85,396 | 71,129 |
| Emsco Derrick & Equipment Co | 571,306 | 444,164 |
| Fairbanks, Morse & Co | 1,465,779 | 563,847 |
| Fairbanks-Morse Co., Canadian, Ltd | 106,940 | 72 344 |
| Gabriel Co | d112,726 | d140,759 |
| Graham-Paige Motors Corp | d1,701,325 | d474,959 |
| General Electric Co., Canadian, Ltd | 1,596,025 | 989,165 |
| General Machinery Corp | 197,323 | d25,735 |
| General Motors Corp | 167,226,510 | 94,769,131 |
| Gilbert (A. G.) Co | 87,443 | 53,936 |
| Hercules Motor Corp | 400,438 | 214,506 |
| Hoe (R.) Co. (4 months) | d15,226 | d250,266 |
| Hoover Steel Ball Co | 192,067 | 82,230 |
| Howe Scale Co | 87,134 | 73,272 |
| International Business Machines Corp | $7,090,530 | $6,597,362 |
| International Harvester Co | 19,618,238 | 3,948,636 |
| Jefferson Electric Co | 342,762 | 303,924 |
| Kellogg Switchboard & Supply Co | 115,030 | 59,780 |
| Lamson & Sessions Co | d220,581 | d190,060 |
| McGraw Electric Co | 614,369 | 502,953 |
| Mallory (P. R.) & Co | 462,035 | 271,144 |
| Marchant Calculating Machine Co | 394,741 | 102,320 |
| Martin (Glenn L.) Co | d318,364 | d59,849 |
| Motor Products Corp | 1,079,640 | 131,385 |
| Murray Corp. of America | 1,430,352 | 798,363 |
| National Cash Register Co | 1,520,409 | 1,115,631 |
| National Enameling & Stamping Co | 312,895 | 372,591 |
| National Radiator Corp. (Md.) | d375,715 | ..... |
| Noma Electric Co | 180,843 | 48,093 |
| North American Car Corp | 171,193 | 260,260 |
| Otis Elevator Co | 1,110,997 | d1,603,317 |
| Packard Motor Car Co | 3,315,622 | d7,290,549 |
| Pyrene Mfg. Co | 133,593 | 91,925 |
| Ralston Steel Car Co | d66,637 | 42,836 |
| Remington Arms Co | 136,525 | ..... |
| Reo Motor Car Co | d219,860 | d958,341 |
| Sentry Safety Control Corp | 3,622 | 2,683 |
| Studebaker Corp. (March 9 to Dec. 31) | d1,975,622 | ..... |
| Shaler Co | 80,924 | 76,887 |
| Sperry Corp | 1,651,461 | 1,878,104 |
| Timken Roller Bearing Co | 7,483,602 | 3,486,056 |
| Trico Products Corp | 3,567,404 | 1,771,558 |
| Union Tank Car Co | 1,475,392 | 1,580,173 |
| United American Bosch Corp | 250,130 | 50,101 |
| United-Carr Fastener Corp | 729,973 | 498,038 |
| United Engineering & Foundry Co | 1,631,156 | 718,395 |
| Utah Radio Products Co | d148,999 | 100,528 |
| Vichek Tool Co | 113,252 | 30,018 |
| Waco Aircraft Co | 4,522 | d66,966 |
| Westinghouse Electric & Mfg. Co | 11,983,380 | 189,562 |
| Westinghouse Air Brake Co | 922,076 | 171,644 |
| Weston Electrical Instrument Corp | 225,462 | 101,720 |
| White Sewing Machine Corp | 35,581 | d82,129 |
| Wilcox-Rich Corp | 956,155 | 548,461 |
| York Mfg. Co | d173,633 | d183,855 |

# PATENTS

## March 11, 1936

### Processes

Method of Electric Arc Welding. Richard Stresau, Wauwatosa, Wis., assigned to A. O. Smith Corp. Patent 2,033,311.

Arc Welding. Arthur J. Rivett-Carnac, Grahamstown, South Africa, assigned to General Electric Co. Patent 2,033,816.

Method of Formation of Radiator Shells. George E. Ireland, Toledo, Ohio, assigned to the City Machine & Tool Co. Patent 2,033,900.

### Furnaces

Heat Treating Furnace. Ernest G. de Coriolis and Jesse R. Moser, Toledo, Ohio, assigned to Surface Combustion Corp. Patent 2,033,331.

## March 17, 1936

### Metal-Working Machinery

Automatically Controlled Abrading Machine. Raymond A. Cole, Worcester, Mass., assigned to Norton Co. Patent 2,033,922.

Machine for Finishing Cylindrical Bodies or Pipes. Carl M. Yoder, Lakewood, Ohio. Patent 2,033,967.

Hydraulic Press System. Thomas F. Stacy, Piqua, Ohio, assigned to the French Oil Mill Machinery Co. Patent 2,034,157.

Milling Machine. Joseph B. Armitage, Wauwatosa, Wis., assigned to Kearney & Trecker Corp. Patent 2,034,221.

Engraving or Pattern Reproducing Mechanism. Robert Kremer and Robert Cummins. Patent 2,034,240.

System of Control for Electric Spot Welding. John P. Tarbox, Philadelphia, Pa., assigned to Edward G. Budd Manufacturing Co. Patent 2,034,275.

Welding Machine. Earl J. W. Ragsdale, Norristown, Pa., assigned to Edward G. Budd Manufacturing Co. Patent 2,034,536

Machine for Electrically Welding Wires. William D. Bumstead, Cleveland, Ohio, assigned to General Electric Co. Patent 2,034,500.

Machine for Plane Grinding Piston Rings. Emil Junker, Zurich, Switzerland. Patent 2,034,621.

### Tools and Attachments

Steel Die Block. Pierre Francois Marie Aubert, Paris, France, assigned to the Nitralloy Corp. Patent 2,033,915.

Closure Cap Feeding Device. John A. Johnson, Woodhaven, N. Y. Patent 2,033,988.

Tool Holder. Michael J. Schlitters, Detroit, Mich. Patent 2,034,118.

Rotary Cutting Tool. Hugh M. Albee, Orange, Mass., assigned to the Leavitt Machine Co. Patent 2,034,277.

Anchoring Device for Cylinder Boring Machines. Clarence T. Rottler, Seattle, Wash. Patent 2,034,488.

Method and Means for Refinishing Ball Bearings. Eric G. Colson, New York, N. Y., assigned to Ford Instrument Co., Inc. Patent 2,034,507.

Apparatus for Marking Metal Tubes During Manufacture. Francis Albert Franklyn and Edward Charles McGregor, London, England. Patent 2,034,614.

Tool Slide Assembly. George F. Yager, Toledo, Ohio, assigned to the Bunting Brass & Bronze Co. Patent 2,034,645.

# EXPORT OPPORTUNITIES

Industrial arc welding equipment. (Purchase). London, England. *388.

Boiler accessories and valves. (Purchase). Bergen, Norway. *412.

Bottling & capping machinery using aluminum tear caps. (Purchase). Prague, Czechoslovakia. *390.

Bottling machinery. (Purchase). Teheran, Iran. *389.

Home industrial machines for leather goods manufacture, button-covering, sewing; tablet and pill making; and small pumps. (Agency). Delhi, India. *415.

Diesel engines for power plants, irrigation pumps, industrial monorail equipment, portable floor-facing machines, lock-morticing machines. (Purchase and Agency). Durban, South Africa. *414.

Glue-making equipment for manufacturing glues and gelatine. (Purchase). Zlin, Czechoslovakia. *391.

Grinding and pumping machines for mines. (Purchase). London, England. *388.

Electric irrigating machinery. (Agency). Delhi, India. *415.

Laundry machinery. (Purchase). London, England. *388.

Lathes and drilling machines, and other machine tools. (Purchase and Agency). Johannesburg, South Africa. *416.

Silk, wool and cotton textile machinery; knitting machines, sewing, bleaching, pleating and finishing machinery machines. (Agency). Lima, Peru. *413.

Thermostats and steam-consumption registering devices. (Purchase). Brussels, Belgium. *420.

Woodworking machinery, small production. (Purchase). Bergen, Norway. *392.

Machinery to make transparent bottles and bottle caps from plastics. (Purchase). Habana, Cuba. *359.

Machine tools, wharf jibs and derricking cranes. (Purchase and Agency). Johannesburg, South Africa. *337.

*Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, or any district or cooperative office.

American Machinist REFERENCE BOOK SHEET ©

# Pressed Parts for Porcelain Enameling

**Abstracted from the "Handbook on Design of Metal Parts for Porcelain Enameling," published January, 1936, by the Technical Research Section, Educational Bureau, Porcelain Enamel Institute.**

## PART II

### Working of the Steel

Metal should not be worked to the limit of its endurance, return flanges should be avoided wherever possible, and large parts with four flanges, whether formed and welded or die stamped, should be embossed if possible to increase rigidity.

The primary causes of warpage and hairlining are high firing temperatures, variations in hardness and treatment of enameling iron, drawing practice, and not using the correct type of enameling iron for a particular design. Design does cause warpage, especially where pieces have flanges and are rim bound. In many cases tools are designed to fold flanges and edges first and crowd extra metal to the center of the part. This leaves a loose piece of metal in the center of the part which is rim bound. The center of the part will naturally grow and warp in the firing operations. This can be overcome in many cases by holding the center part of the piece being formed by a pressure pad and forming the edges and flanges last.

Parts formed on brakes and flanging presses, where flanged on four sides, will be difficult to enamel if the hold-down of the brake or press blank holder fails to grip the metal tightly from end to end. Brakes as used in many fabricating shops are too light for the gauge of metal in use, or due to long use on shorter parts, are worn at some point and do not grip the metal firmly when the flanges are formed, particularly on long parts. This permits the metal to crowd back under the hold-down when the flange is formed, resulting in excess or loose metal in the center and an "oil can" effect on the finished part. During firing, this loose metal works due to the rim bound condition, with warpage and hairlines as the result. The remedy is to provide a firm grip of the metal throughout the length of the flange by the use of a brake in good condition, heavy enough for the metal being worked, and in the case of the flanging press, sufficient grip by the blank holder to insure no slippage of metal while the flange is being formed.

This method of working steel will leave a tightly stretched metal through the center of the part and will cause less warping trouble when enameling. All designs for rim bound parts in which excess metal cannot be avoided should have panels or embosses formed where the loose metal exists. Heavier gauge metal will correct warpage in many cases where the cost is not prohibitive. If the cost is prohibitive, it will be necessary to resort to methods of embossing described above. Residual stresses concentrated to a certain point will cause both warpage and hairlining if the amount of the stress is greater than the strength of the steel. In about 25 per cent of the cases, hairlining will occur with warpage and is usually overcome when warpage has been eliminated or a change of design has been made that does not permit a great movement of the steel during the firing of the enamel.

In all cases, close cooperation between the design engineer, tool making department and the enameling department is essential if best results are to be attained. Poor drawing and forming dies and equipment cause more trouble in enameling shops than bad enameling practice, and in many cases produce parts which are almost impossible to enamel properly. See Fig. 10.

### Treatment of Holes

Holes in parts that are to be visible on finished parts, where good coverage and appearance are necessary, must have the edges turned back or extruded, similar to countersinking, to attain the desired result. This is due to the tendency of the enamel to pull away from and burn off sharp edges;

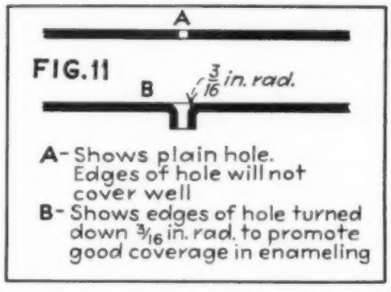



FIG. 11

A- Shows plain hole. Edges of hole will not cover well

B- Shows edges of hole turned down 3/16 in. rad. to promote good coverage in enameling

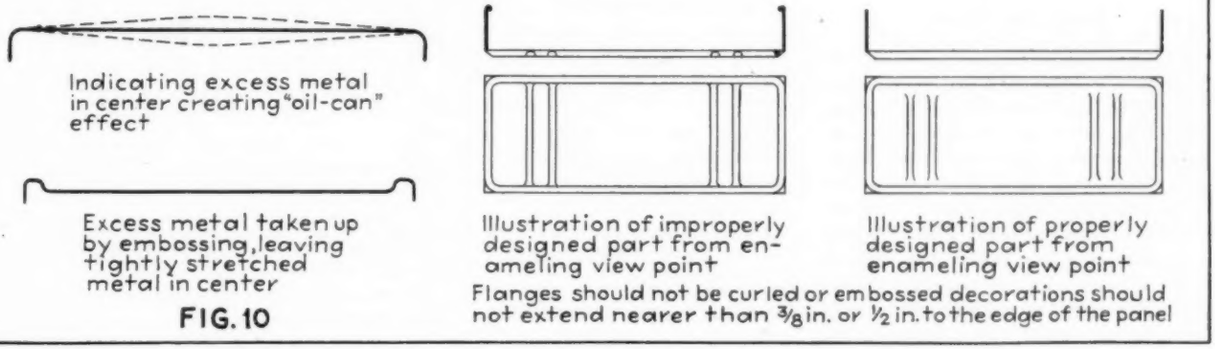

Indicating excess metal in center creating "oil-can" effect
Excess metal taken up by embossing, leaving tightly stretched metal in center
Illustration of improperly designed part from enameling view point
Illustration of properly designed part from enameling view point
Flanges should not be curled or embossed decorations should not extend nearer than 3/8 in. or 1/2 in. to the edge of the panel

FIG. 10

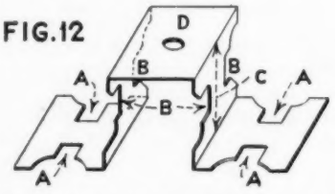
# Pressed Parts for Porcelain Enameling

it is inherent in the material, and can only be obviated by the turning back of the edges as mentioned above. The radii of the turned back edge should be no less than 3/16 in. See Fig. 11.

### Attachment Devices

Where it is necessary to weld lugs or clips to the back of parts for mounting to avoid visible bolts, the parts welded on should be at least two gages lighter and where possible cut out to reduce the total area of double thickness. This permits the panel to heat up more uniformly and avoids danger of under-firing at the points where lugs or clips are applied. Holes for mounting should never be located close to an emboss or flange, as chipping is apt to occur due to bending of the metal when the mounting bolts are tightened. Holding clips and lugs should not be welded on the back close to an edge bead or an emboss for the same reason. See Fig. 12.

FIG. 12




A- Cut out to decrease area of double thickness
B- Cut out to facilitate bending without distorting base
C- No less than 3/8 in.
D- Screw hole usually tapped or threaded

### Assembly Hints

Make sufficient allowance for accumulation of enamel in these attachment devices to avoid strains from drilling, filing and other operations incident to assembling the product. The height and dimensions of clips to be tapped for screws should be such as to avoid danger of pushing tap through too far and damaging the part. The vertical sides of such clips or brackets should be weakened by cutouts to permit bending to some degree in assembly, without distorting the flat surface to which they are attached. The area of the clip actually in contact with the piece at point of welding should also be cut out to decrease as much as possible the double thickness of metal.

Long strips of any gauge should never be welded to the back of parts for any reason. If mounting problems necessitate some such practice, the design should be changed so that individual lugs or clips can be used. The long strips cause the face of the panel to buckle and warp due to uneven heating and expansion, resulting in warpage, hairlining and chipping.

The one exception to the above statement is in regard to parts used in a dark one-coat finish, such as oven linings. Here such practice is permissible since the perfection of finish is not important. Even on such parts certain designs are troublesome in the enameling operation, as evidenced by the example shown in Fig. 13.

The basic design of a porcelain enamel product determines to no small extent whether or not a subframe is necessary. If a product is built up from individual pieces or panels, it is probably wise not to depend on their assembly to constitute a supporting frame work for the product in the gauges ordinarily used for such work. In some instances, if the unit is small and of light weight, such practice might prove successful, but is no criterion of what may be expected in larger and heavier units.

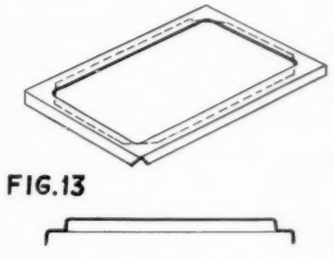
### Design of Box Structures

The design of refrigerator linings has been subjected to the intensive study of the engineering departments of numerous large manufacturers of these products. The consensus of opinion indicates that the following table should be observed in regard to gauge of metal:

| Gauge | Cu.Ft. Capacity |
|---|---|
| 20 | 4 |
| 20 | 5 |
| 18 | All larger sizes |

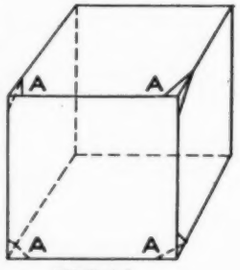
The open side of the liner should be reinforced by a bead or flange, and where light gauge metal is used strengthening of corners by welding strips on the outside is good practice. Corners and seams should be formed with at least ¼ inch radii, and corner welds are satisfactory. See Figs. 14 and 15.

FIG. 13



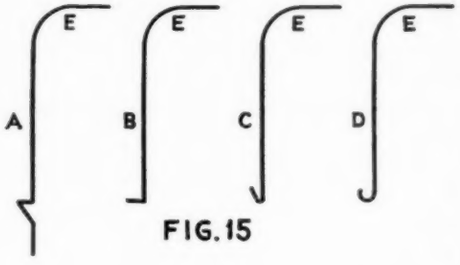
Improperly designed part. Double thickness of metal sets up strains, chipping enamel from points adjacent to welds nearest the ends

FIG. 14




A- Reinforced corners. Not necessary if gage of metal is correct and opening is properly flanged or embossed

FIG. 15




A, B, C, D, Various types of flanges that may be used to reinforce refrigerator door opening
E- No less than ¼ in. rad. at all corners

# IF THE WORKER ONLY KNEW—

## Would he be so sure the other fellow paid the taxes?

"HOLD ON a minute, Bill," said Sam, as the pair walked home from the shop, "I want to run in and get a pack of cigarettes." Returning a minute later with his newly acquired smokes, Sam observed, "These sales taxes are getting to be a nuisance, a penny here and there doesn't look like much at the time, but it mounts up at the end of a week."

"That's only the state sales tax, Sam; just a drop in the bucket. See that stamp on your pack? That means the federal government has already collected six cents. But you'll be paying plenty more taxes before long."

"They can't hook me for much, Bill. I don't own my house so there's nothing to pay there. It's true they soak me on gasoline and 'most everything else I buy, but I figure they've about gone the limit on sales taxes now. Some of the fellows with plenty of money will have to stand the rest."

"They're standing plenty now. Uncle Sam rakes off income surtaxes as high as 70 per cent and we have the highest maximum estate taxes of any country in the world."

"That *is* pretty steep."

"Yes, and tax experts are pretty generally agreed that any considerable boost in revenue must come either from higher taxes on small incomes, or more sales and excise taxes. That means you'll have to pay."

"But with all the taxes we have now, Bill, why does the government need any more money?"

"Simply because last year it laid out $135 for every person in the United States and collected only $117 in taxes. You can see that can't go on without coming up against a big bump some day."

"Well, Bill, why don't the government cut down a little and lay off these tax raises for a while? If it did, business would get better, and we'd all have more to spend."

"Now you've said something, Sam. That's exactly what should be done, but if you were a politician instead of a machinist you'd find it hard to do. For instance, those turbines in the shop now are for a PWA job, and we were glad to see the order come in. The farmers were voted a $500,000,000 subsidy under the guise of 'soil conservation,' and the doughboys finally got theirs. All these groups put a lot of pressure on their representatives. A man who has to run for reelection finds it pretty hard to resist."

*. . . the farmers were voted a subsidy and the doughboys got theirs*

"How about the man who pays the taxes, Bill? He's got a kick coming; why doesn't he put up a squawk?"

"Some of them do, Sam, but most of them are like you. They're paying taxes without knowing it and watching the government pile up a big deficit without worrying about it."

"What do you mean without knowing it? I guess I know what I pay."

"On direct taxes, yes, Sam. But a great many taxes are indirect and you pay them in increased living costs. For instance, the old AAA processing taxes meant higher prices for food and clothing. Corporation taxes must be added to the cost of the things the corporations produce. Since business must keep out of the red to exist, the consumer finally pays the bill all along the line."

"But look here, Bill, if a lot of this money is being put back into circulation through government projects and farm grants, why isn't it doing just as much good as if it were circulated by private enterprise?"

"All of these activities require bureaucratic control, Sam. And bureaus absorb so much that only a few of the dollars collected ever perform useful work. Government bureaus are notoriously wasteful since they do not have the same incentive for efficient performance that private business does."

"It does look kind of bad, Bill, but where does the whole thing end? Government costs and taxes can't keep on going up forever, even if Congressmen do want to be reelected."

"It won't end until spending and taxes become unpopular; until retail prices rise so much you find it hard to pay your bills; until interest rates go up and government bonds go down; or, even worse for the worker, until government credit and the value of currency is impaired."

"But can't something be done before any of those things happen?"

"Sure it can, if you and the other industrial workers who will eventually pay the bill will only let your Congressman know that you want saving instead of spending. Let them know you've had enough now before high prices and high taxes pinch till it hurts."

***The series to date: 30-Hour Week; Townsend Plan; Labor Relations Law; Taxes. Each available in 3x5 pamphlet form for management to distribute to workers***

# Ideas FROM PRACTICAL MEN

## Floating Jaw Fixture

FRANK HARTLEY

The illustration below shows a fixture for holding shafts to be splined. On the right-hand end of the base the end block *A* is mounted, against which the work, indicated by heavy dotted lines, is confined endwise by the knurled head screw *B* in the end block *C* on the left-hand end. To support the work under downward pressure of the cut, V-blocks having shallow V's are mounted on the base as shown at *D* in the end view. Beveled surfaces on the jaws *F* and *H* grip the work and hold it down in the V-blocks. Jaws *F* are tapped for the clamping screws *I*, while jaws *H* have clearance holes for the clamping screws.

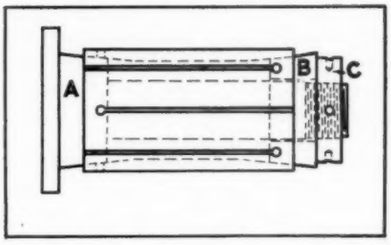
The bodies of the clamping screws pass through clearance holes in the V-blocks. It will thus be seen that while the jaws can float sidewise of the fixture, their clamping screws passing through the holes in the V-blocks keep them from rising and permit their beveled surfaces to pull the work down in the V-blocks. Spring-actuated pins *K* and *L* keep the jaws open when the clamping screws are loosened. Small pins *M* engage loosely in blind holes *N* and limit the movements of jaws *F*. The three clamping units shown are all of the same construction and any number of them can be used.

## An Expansion Mandrel

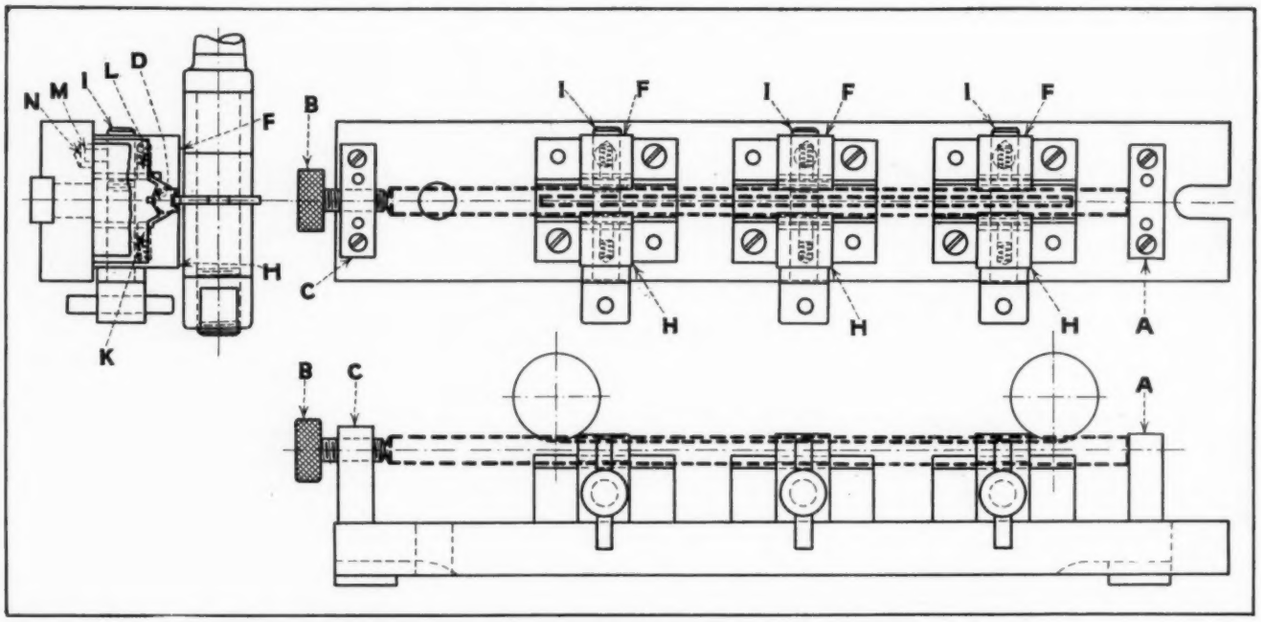
MICHAEL AXLER

While the expansion mandrel described by Charles C. Tomney (*AM*—Vol. 79, page 926) is all right in a way, it has some disadvantages. If the bore of the cylinder mounted on the mandrel for facing the flange is 0.015 in. or more larger than the unexpanded mandrel, the cylinder will not be held so that the flange can be faced square with the bore, as the mandrel will expand at one end only, being tight at the front and loose at the back.

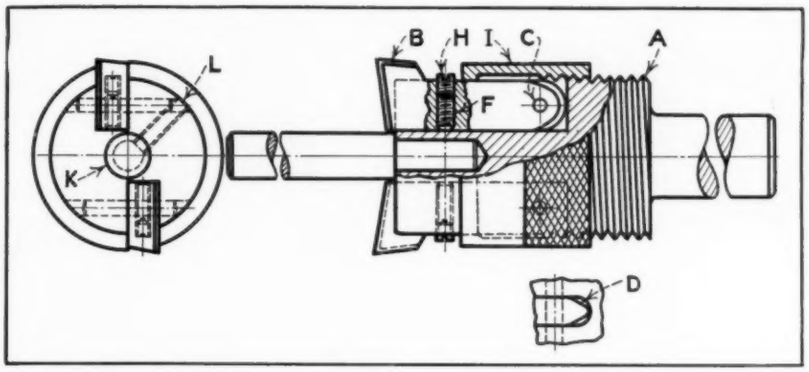
The expansion member of a mandrel illustrated is better adapted to the job referred to than is the one described by Mr. Tomney, since it can be expanded at both ends. The solid member of the mandrel is tapered at *A* near the shoulder and the expansion member is alternately slit from opposite ends and its bore is tapered at both ends in opposite directions, so that one end is expanded by the taper on the solid member and the opposite end is expanded by the taper sleeve *B* as it is forced toward the solid member by the nut *C*. Expansion members of different diameters can be used with the same solid member.




*The expansion member is tapered at both ends and is alternately slit from opposite ends. One end is expanded by the taper on the solid member and the other by a taper sleeve*




*Floating jaws having beveled surfaces clamp the work and hold it down in V-blocks. Any number of clamping units can be used according to the length of the work*




*The pivoted cutters can be adjusted to compensate for wear or for metal removed in sharpening. An axial hole is provided in the end for a pilot, drill, or secondary boring bar*

## An Adjustable Boring Bar

JOHN A. HONEGGER

In the adjustable boring bar illustrated, the body *A* is threaded as shown and slots are milled for the two pivoted cutters *B*, the pivots being at *C*. The rear ends *D* of the cutters bear against the ends of the slots to relieve the pivot pins from the thrust of the cut, as shown in the small view below.

Screws at *F* are provided for adjusting the cutters and are locked by screws *H* above them. After the cutters have been adjusted and the adjusting screws have been locked, the threaded collar *I* is screwed along, forcing the lower ends of the adjusting screws against the bottoms of the slots and holding the cutters tightly in adjustment.

A pilot, drill, or secondary boring bar can be inserted in the axial hole *K* in the end of the bar and locked by screw *L*. A bar of this type can be used in either the drill press or the turret lathe. It can have more than two cutters by providing additional slots.

## Angular Spindle for an Electric Drill

WILLIAM STEUER
*Tool Designer,*
*Electric Service Supplies Company*

The angular spindle illustrated is for use in an electric drill for drilling small holes in close quarters. Without some such device, either the chuck or the housing of the drill would interfere.

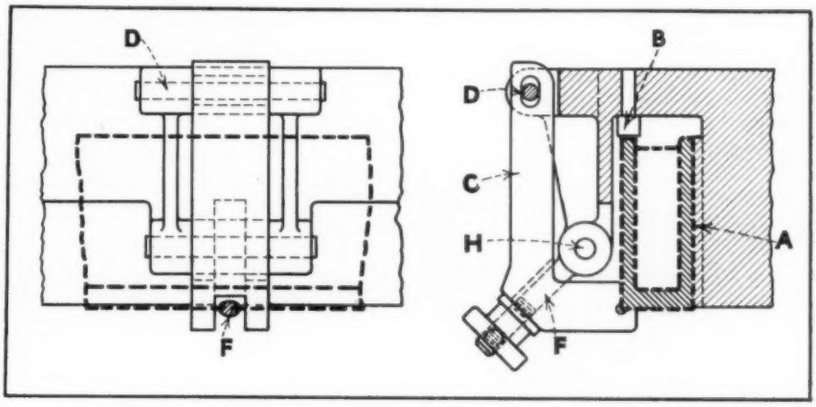
The spindle consists of the steel tube *A;* the driving shaft *B;* the flexible shaft *C;* the adapter *D;* and the collar *F*... The tube has a wall thickness of about 1/16 in. and is bent at an angle of 30 deg. near one end. The flexible shaft is welded into both the drive shaft and the adapter, and the outer end of the drive shaft is turned to fit the drill chuck. The drill is sweated into the adapter with solder so that in case of breakage it can easily be removed and replaced by another drill. The tube is packed with grease.

## Pivoted Floating Clamp

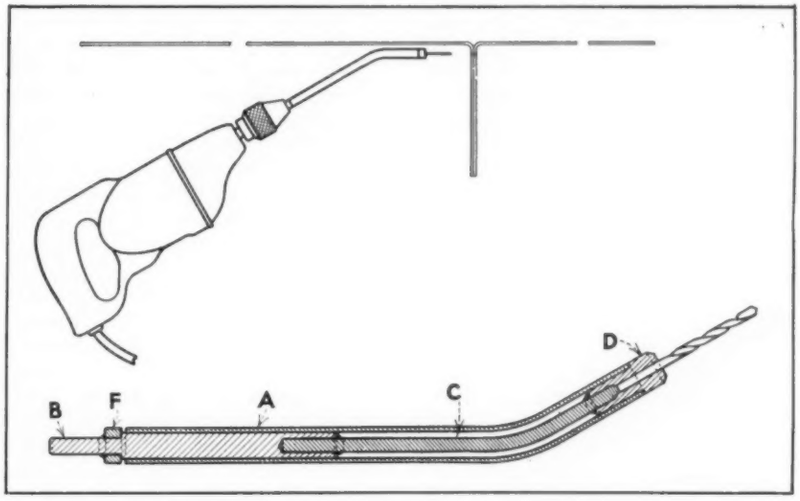
F. SERVER

In the fixture illustrated, the work indicated in heavy dotted lines is held sidewise against the seat *A* and upward against the stop pin *B* by the pivoted clamp *C*. The clamp is pivoted at *D* and is operated by a hand nut on the eyebolt *F*, which is pivoted at *H*. The pivot hole in the clamp is elongated so that the clamp can float vertically within the limits of the elongation to allow for variations in the work. The lower end of the clamp is slotted and the body of the eyebolt fits loosely therein.

In loading, the clamp is pushed against the work, the eyebolt is swung into clamping position and the hand nut is tightened. When the work is to be removed, the hand nut is loosened and the eyebolt is swung downward, leaving the clamp free to be swung outward on its pivot pin.

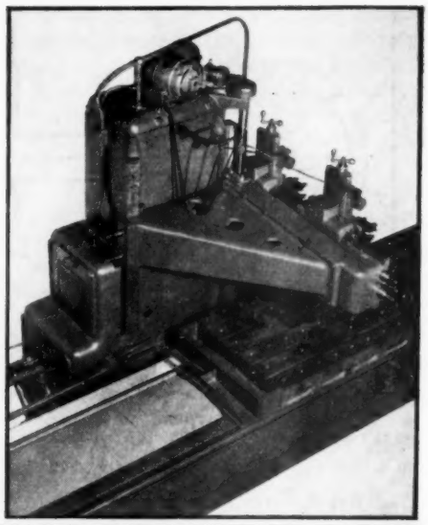



*The pivoted clamp floats vertically to allow for variations in the work*




*The tube is bent at an angle of 30 deg. and houses a drive shaft, a flexible shaft, and an adapter, into which the drill is sweated with solder*

# Shop Equipment NEWS



## Rockford "Hy-Draulic" Planer

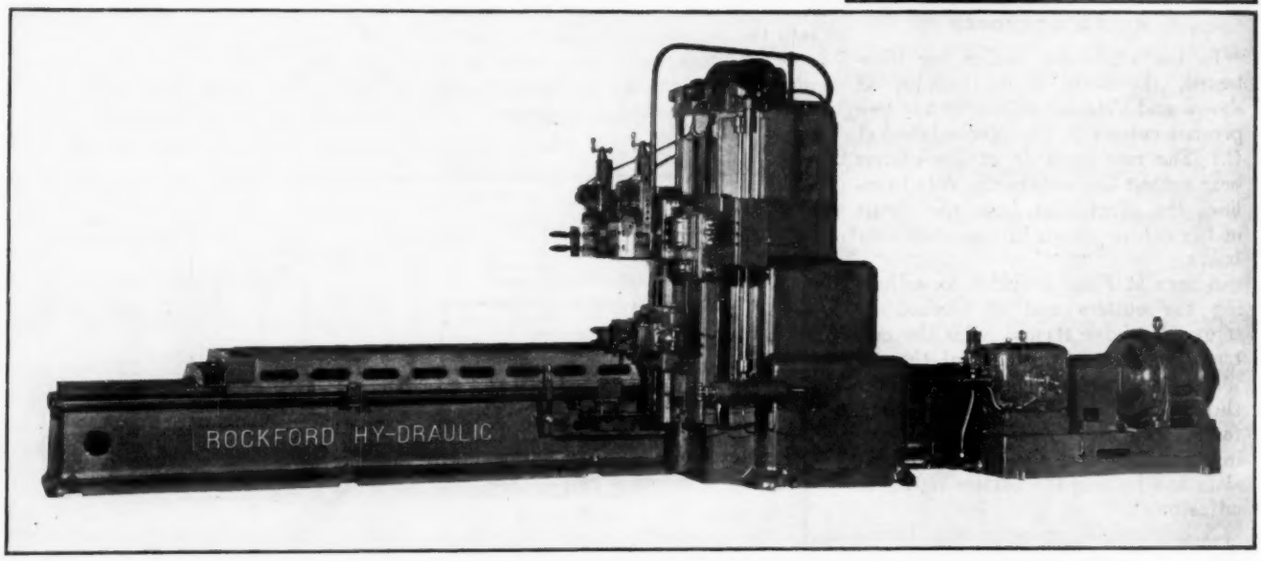



*Fig. 1—Hydraulic pressure reciprocates the table, provides feed for all heads. Thus, speeds and feeds are infinitely adjustable. Fig. 2—A rigid back brace behind the cross-rail takes the cut*

The "Hy-Draulic" planer, Fig. 1, has been put on the market by the Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill., to round out the line of "Hy-Draulic" shapers and shaper-planers. Use of hydraulic power for reciprocating a machine table has numerous advantages claimed by the builders. It eliminates heavy reciprocating or rocking parts, joints, linkages and gears from the table drive. It simplifies construction and makes direct application of power. It is claimed that it lengthens the life of cutting edges, and provides a smooth, powerful, steady cutting stroke which can be adjusted readily to any desired rate within the capacity of the hydraulic equipment. It eliminates "gear marks" on the work, and prevents chatter. The cutting speed of the table reaches the established rate almost instantly upon reversal and remains constant throughout the entire stroke. Table reversals occur without shock in a minute period of time. Rapid return-rate of the table is constant, regardless of the cutting speed employed.

Hydraulic pressure is used in this planer for feeding all heads. The feeds, like the cutting speeds, can be adjusted instantly to any desired amount within the capacity of the machine. The feeding movement is smooth and rapid, being completed before the tools enter their next cut.

Referring to Fig. 1, the "power house" for the machine is seen at the right-hand end of the bed. This comprises the main driving motor directly connected to the hydraulic power unit, both mounted on a heavy base. This arrangement reduces the number and length of the necessary hydraulic connections, eliminates vibration, provides complete protection, accessibility and ample ventilation. Handwheels on either side of the hydraulic power unit enable the operator easily to adjust cutting speeds and the return rate.

The double-length box section bed is heavily ribbed. The table is of box-section design and has T-slots, hold-down holes, adjustable control dogs, and clean-out openings, chip pocket and tool tray at one end, double oil-wipers at both ends for both ways. The table never overhangs bed. In the center is the massive column which supports the crossrail and contains the electrical and hydraulic control panels. On top of the column is the motor-driven mechanism which provides rapid traverse to all heads and power elevation for the rail.

Fig. 3 shows a close-up of the col-

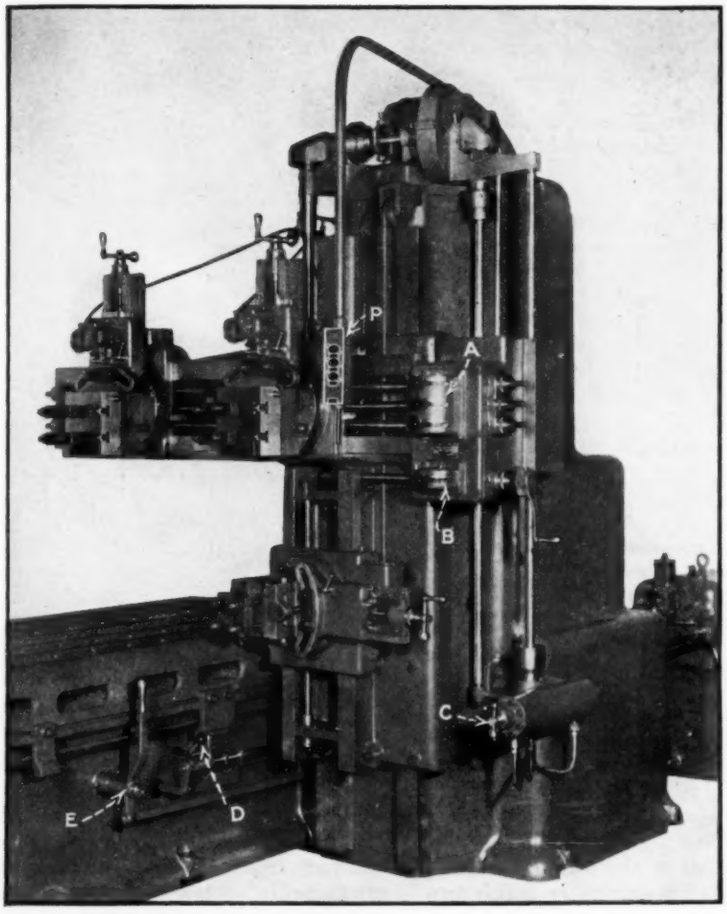



*Fig. 2—Rail heads are controlled at A, the side head at B*

umn, heads and rail. The bearings for the slide are accurately machined and scraped, widely spaced, provided with a narrow guide and tapered gib. Mounted on this slide is the sidehead rail which is pivoted at its upper end and provided with a fine adjustment at its lower extremity, providing a permanent means for accurately aligning the sidehead rail, which is then solidly secured in position by heavy bolts. The pendant, *P*, contains push-button controls which establish the direction of rapid traverse for the rail-head, a master motor switch, and a rod by means of which the machine can be stopped instantly. Three levers, *A*, provide complete control for the power-operated movements of both rail-heads including feed or rapid traverse to left or right, up or down, separately or in unison. Lever *B* performs the same service for vertical movement of the sidehead. By means of the ballcrank, *C*, the operator can secure instantly any desired feed rate within the capacity of the machine. Lever *E* starts and stops the table movement, lever *D* reverses its direction. Both of the rail-heads shown in Fig. 3 are equipped with automatic tool-relief devices.

Fig. 2 shows the openside construction of this planer; the rigid box-section, cross-rail back brace with its broad base, powerful locking bolts, and tapered gib. In this side of the machine-bed will be seen duplicate controls for starting, stopping, and reversing the table movements. A heavy sheet-metal cover between the ways extends the length of the bed underneath the table.

Maximum pull to the table is 24,000 lb.; maximum distance from table to underside of crossrail, 37½ in., and the length of bed may be had from 23 to 45 ft. The length of table is also optional, from 12 to 22 ft., and the width of table is 36 to 42 in. Horizontal adjustment of sidehead slide is 11 in., down adjustment of rail-head slide is 11½ in., the cutting speeds of table per minute is optional and may be had from zero to 50 ft., or more. The return speed is also optional from 10 to 150 ft., or more. Horizontal feeds of rail-head are from 1/42 in. to ½ in., vertical feeds of rail-head are from 1/96 in. to ½ in., and vertical feeds to side-head are from 1/48 in. to ½ in. Horizontal feeds to sidehead may be had. Power rapid traverse is provided for both railheads in both directions. Side-head has vertical power rapid traverse.

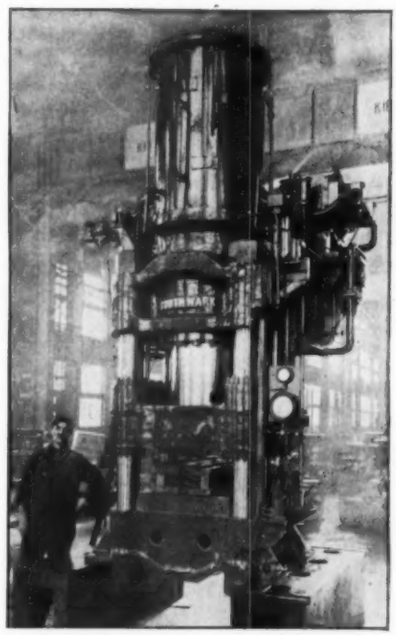
Hy-Draulic planers are also available with double housings, and in larger sizes.

## Southwark 500-Ton "Hyspeed" Press

The "Hyspeed" 500-ton, "moving down" type hydraulic press designed by the Baldwin-Southwark Corp., Philadelphia, Pa., permits rapid and highly efficient production. Although especially suited for pressing parts from hot steel, the press can readily be adapted to forging, forming, and operations of a similar nature. Fifteen strokes per minute are obtained from this self-contained machine.

The motor driven rotary piston pump and the necessary oil tanks are mounted on the top platen. The stroke of the moving platen can be adjusted and set to any pre-determined distance, and it can be set to stop and return automatically when a specified pressure has been attained under the die, or a pre-determined height above the bottom die has been reached.

For die setting, a manual valve control on the pull-back cylinders permits a delicate and accurate regulation of the platen movement, making possible accurate alignment of dies. The tank



*Baldwin-Southwark 500-ton "Hyspeed" hydraulic press delivers 15 strokes per min. for forging and forming*

is on top of the main cylinder and under the pump and motor is the leakage tank. Forged steel is used in the columns of the press, which are shrunk in. Platens, cylinder, and other main parts are cast steel, and the ram is of close-grained cast iron.

## Rockford Horizontal Drilling Machine

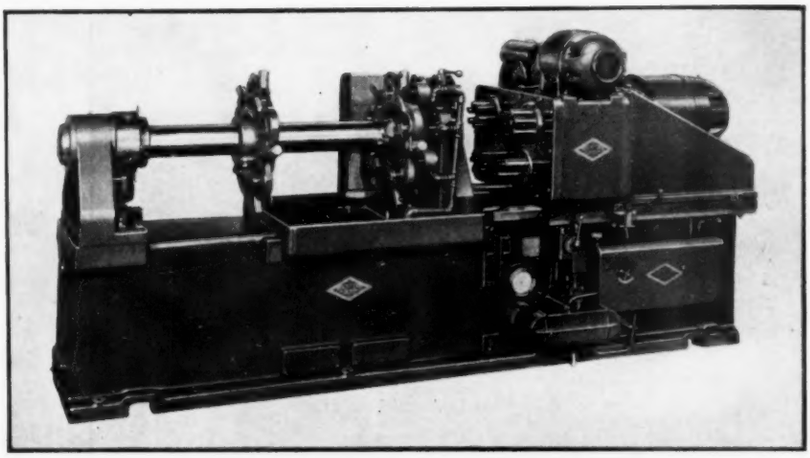
The horizontal drilling machine, with automatic hydraulic operating cycle, recently built by the Rockford Drilling Machine Co., Rockford, Ill., is equipped with a five-station fixture and tooling for work on the flange of a large crankshaft. It loads and unloads workpieces; drills six holes, and mills out the center of the flange; drills two locating holes; countersinks six holes, and reams two locating holes, and taps six holes. For this work, 23 cutting tools operate simultaneously. The hydraulic circuit is used for tapping.

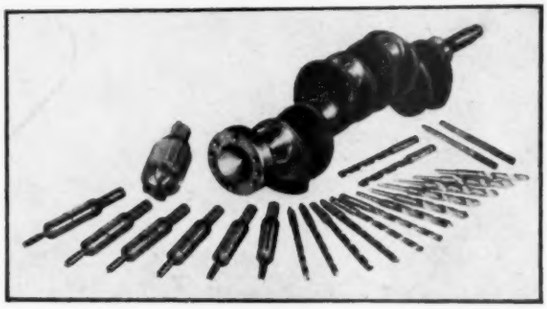
The machine has a large base containing the hydraulic equipment with centralized control, coolant pump and reservoir. Provision is made for confining used coolant and for chip handling. On the right-hand end of the bed is mounted a traveling head having automatic hydraulic cycle of rapid approach, feed, dwell for fine finish on milling and countersinking, rapid return and stop. Easily adjusted dogs on the lower edge of the traveling head govern its automatic operating cycle. Manual control for setting-up purposes is provided by a conveniently placed lever.

A central pushbutton station provides the operator with complete control of the machine and enables him to stop it instantly at any point in its cycle. If the machine should be stopped for any reason, the taps automatically rotate correctly when operation is resumed.

The head has one main driving motor, and another for driving the group of tapping spindles independently. The second motor reverses automatically for rapid return upon completion of the tapping operation, thus avoiding reversing the main driving motor and protecting it against excessive overloads. Drills, milling cutter and cuntersinks do not rotate backwards when leaving the work, protecting finished surfaces and cutting edges.

A detachable plate on the front of the head contains the 23 spindles arranged in four clusters, making it possible to adapt the machine to engineering changes in workpieces, or to use it for many other kinds of work by changing spindle arrangements, tooling and work-holding devices.





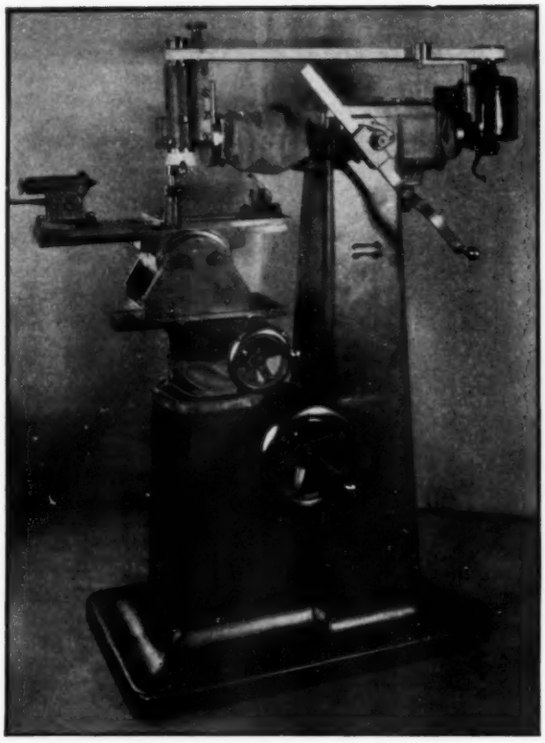
*Although set up with 23 spindles on a detachable plate for performing operations on a crankshaft, this Rockford machine is adaptable to other kinds of work*

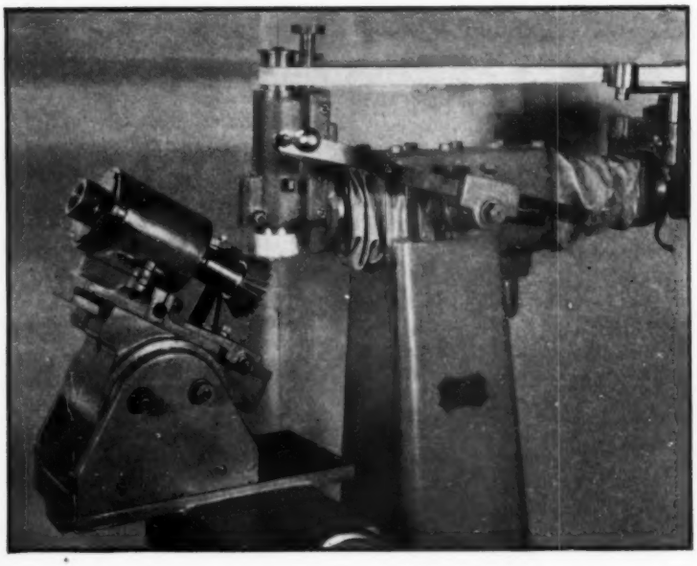
At the left of the traveling head is the five-station fixture in which two work-holding heads are mounted on a heavy central shaft that rotates in anti-friction bearings for easy indexing. One of the heads is adjustably mounted on the central shaft to accommodate work-pieces of different lengths. An integral cup gage in the fixture facilitates accurate location of work-pieces. An electrically operated locating plunger facilitates rapid manual indexing of fixture, and a large mechanically operated guide-bar locks the fixture securely in position during machining. A copious supply of coolant starts and stops automatically as machining begins and ends. The combination of a five-station fixture with locating gage, simultaneous operation on four workpieces, and automatic operating cycle allows high production, limited only by the longest operation.

*Abrasive cutting-off machine for plastic material up to 2½ in. built by the White Engineering Laboratories, Inc.*

## White Abrasive Cut-Off Machine for Plastics

An abrasive cut-off machine for plastic rods and bars, which may be operated either by hand or foot, has been developed by the White Engineering Laboratories, Inc., R.F.D. 1, Paterson, N. J. It is designed for cutting softer materials up to 2½ in., but may be used for cutting small sizes of steel, either dry or under the flow of water. The coolant is automatically shut off by raising the wheel arm. A work receptacle under the machine takes care of waste water. All moving parts are equipped with ball bearings, including the pivot for the wheel arm. Particular attention has been paid to ease of operation and good visibility of cutting-off.





*Angular cutters are easily sharpened on this machine. Universal adjustments are provided for the fixture and the wheel*

## Oliver Universal Cutter Grinder

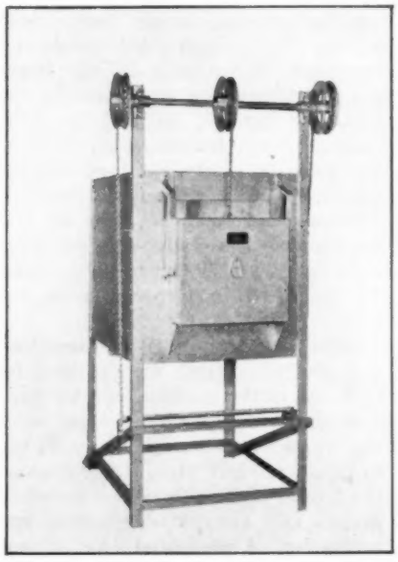
The universal tool and cutter grinder announced by the Oliver Instrument Co., Adrian, Mich., is fitted with a universal fixture having adjustments in all directions and arranged to hold a few simple toolholding fixtures. The grinding wheel is reciprocated by a ram. The wheel is mounted at the front and the motor at the back, the two being connected by a belt. The ram, spindle and motor are all above the grinding wheel and away from the flow of grinding particles.

When grinding a cutter, the work is directly in front of the operator and the tooth being ground is always in view. When sharpening a dovetail cutter, it is mounted in a bearing which is attached to the universal fixture, set to the angle of the cutter, a liprest is attached to the slide, the blade adjusted, the clearance angle of wheel set and the operation of sharpening proceeds. Liprests are designed with short, strong rests to handle any cutter easily. Clearance is obtained by tilting the grinding wheel to the desired clearance angle by direct reading, and no tables or computations are necessary. Teeth may be backed off without changing the setting of the cutter. Angular cutters, dovetail cutters, and the end teeth of end mills, which are usually difficult to hold and grind accurately, are easily handled in this machine. Graduations are larger, and correct angles easily set. The machine is driven by a ½-hp. motor and weighs approximately 1,000 lb.

## Trent "H" Electric Furnace

Development of the "H" line of electric furnaces has been announced by Harold E. Trent Co., 618 North 54th St., Philadelphia, Pa. It is rated at 14 kw., 230 volts, single phase, and is capable of working up to temperatures of 1,850 F. The inside dimensions are 12 in. wide by 9 in. high by 24 in. deep.

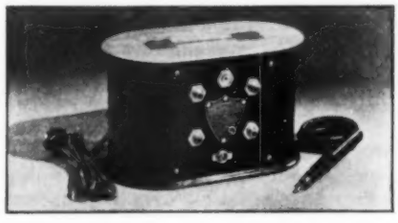
The door is lifted by a treadle and the chain can be locked in any desired position, and is automatically released when the occasion arises to close the door. The door structure and door locking are designed to make the furnace air- and heat-tight, without a sand seal. The furnace is equipped with the Trent "folded and formed" heating element on all four walls, and even heat is maintained from the front door to the back wall.



*Trent "H" furnace, to heat up to 1,850 F., is well sealed*

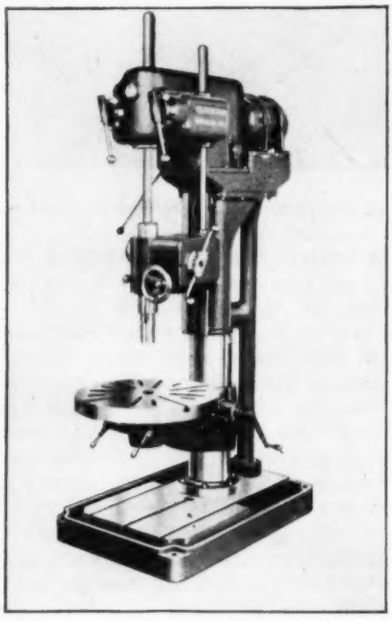
## Frampton Demagnetizer and Etcher

A combination demagnetizer and etcher is announced by Frampton Electrical Equipment Co., Norwood Bldg., Dayton, Ohio. Its compact size and light weight make it portable. In cases where heavy tools or dies must be demagnetized, the unit can be placed over the piece. The etching pencil is equipped with a low electrical jack for metals of about 0.015 in. thickness; a medium sized for about ⅛ to ⅝ in., and a high one for from ⅝ in. to thickest piece. These three stages prevent burning thinner pieces. Weight, 16 lb.



## Cleereman Sliding-Head Drilling Machines

The Cleereman Machine Tool Co., Green Bay, Wis., announces an additional and improved line of "Cleereman" all-geared, anti-friction bearing, automatically oiled sliding-head drilling machines. These machines have nine feeds ranging from 0.005 to 0.045 in., twelve spindle speeds are provided and these can be made in two ranges 50 to 1,000 and 75 to 1,500 r.p.m. They are furnished in round column

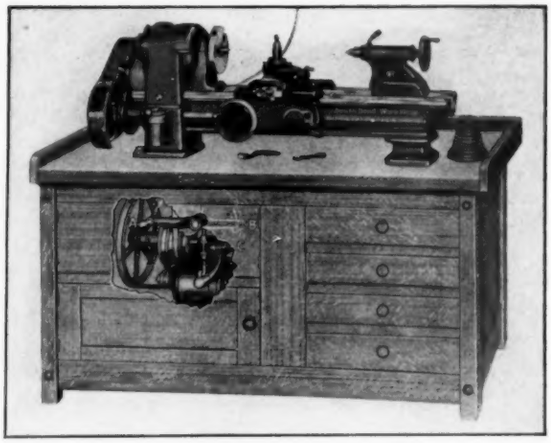


type and in sizes of 21, 25 and 30 in. They can also be made in gangs of from two to six spindles. Arrangements for single-purpose production tooling can be furnished to meet individual requirements.

The feed and speed box, both built on the unit principle, house all of the speed and feed gears and shifting mechanism, are full ball bearing, compact and simple. Both the speed and feed mechanisms have only one lever.

Gears and bearings in the speed head and gear box are automatically oiled by the pressure pump system. A gage in front of the machine constantly gives the oil pressure reading. Sliding head is kept lubricated by an oil reservoir and the worm in this head is submerged in oil. No frictions or clutches are used for controlling the starting, stopping and reversing of spindle, thus eliminating a mechanism which requires frequent adjustment. A standard ball-bearing, direct-connected, reversing motor of 1,200 to 1,800 r.p.m., of low starting current, and high torque type, is used, with built-in push-button controls for the forward, reversing and stopping of spindle.

The machines are offered through exclusive agents appointed by Bryant Machinery & Engineering Co., 400 West Madison St., Chicago, Ill., national distributor for "Cleereman" tools.



*Underneath drive to the spindle is accomplished from a pivoting frame supporting the motor*

## South Bend 9-In. Bench Lathe With Underneath Drive

The 1936 model 9-in. "Workshop" lathe now may be had with underneath belt motor drive, South Bend Lathe Works, South Bend, Ind., announces. The lathe is mounted on either a frame or cabinet bench, and the motor and drive unit are supported on a pivoting frame underneath the bench top. The belt tension release crankhandle controls the position of the frame and countershaft. When the crankhandle is moved in a semi-circle, the entire driving unit is lifted vertically about 2¾ in. to allow shifting the spindle belt. A turnbuckle adjusts spindle belt tension. A hinged cover incloses the headstock which can be raised upward to shift the belt.

The lathe may be had with the flat or V-belt drive. The former has a three-cone headstock providing six spindle speeds ranging from 39 to 630 r.p.m. The V-belt has a four-cone headstock with eight spindle speeds which range from 44 to 585 r.p.m. Both cut screw threads from four to 40 per in., and with a fine-screw-thread cutting attachment the number is increased to 80 threads per in. Among the new features of the underneath motor drive are down drive to the spindle, insuring a powerful and silent drive; completely inclosed mechanism.

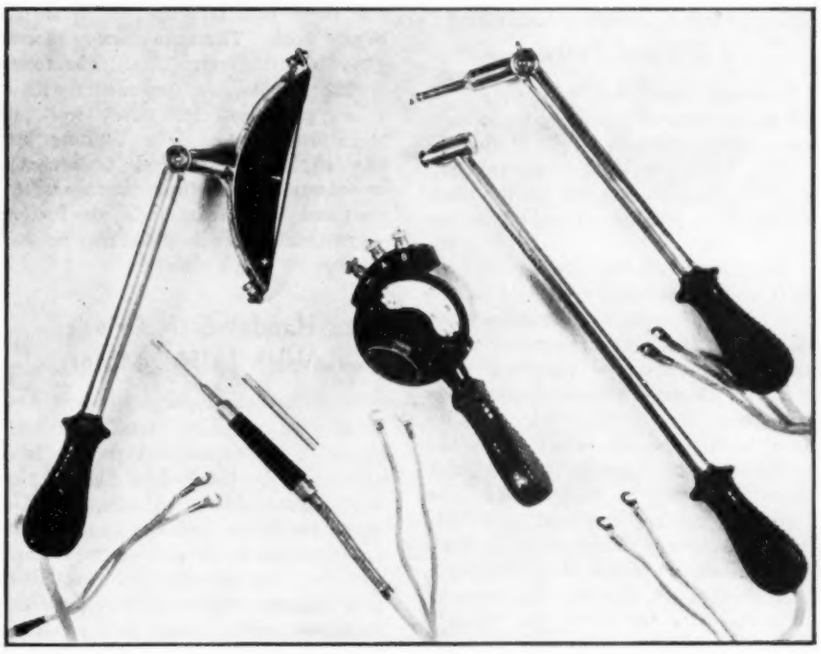
## Ex-Cell-O No. 48 Face and Peripheral Grinder

The No. 48 carbide-tool grinder for grinding all sizes of single point turning, facing and boring tools, right or left hand, high-speed steel and cemented-carbide tools of the larger size range, has been announced by the Ex-Cell-O Aircraft & Tool Co., 1200 Oakman Blvd., Detroit, Mich. Peripheral gringing on straight type vitrified wheels, and face grinding on cup type vitrified wheels can be done on this machine. It is a double-end, ball bearing grinder, and is driven by a double "V"-belt from a 1-hp. motor in the base.

Adjustable tool tables with hardened and ground surfaces are provided for each end of the machine, one for using a straight wheel and the other for a cup wheel. Another table may be had to take a straight wheel. A slot across the face of each table guides the wheel dresser and angularly adjustable tool protractor. A graduated scale on each table is for adjusting the table up to 16 deg. above or below center. A dust exhaust opening is cast at each end of the machine base below the grinding wheels. At the front of the machine base is mounted a tool tray and switch compartment.

## Combination Needle and Surface Pyrometers

A set of combination surface and needle pyrometers has been put on the market by the Pyrometer Instrument Co., 103 Lafayette St., New York, N. Y. By a quick interchange of various types of thermocouples, the instrument is transformed into four different types of surface and needle pyrometers. The indicator is equipped with "Pyro" clamping device whereby contact and reading of actual temperatures no longer have to be made simultaneously, because the indicating needle will stay fixed at the correct temperature indication. It was designed for use in die-casting, plastic molding and other operations.

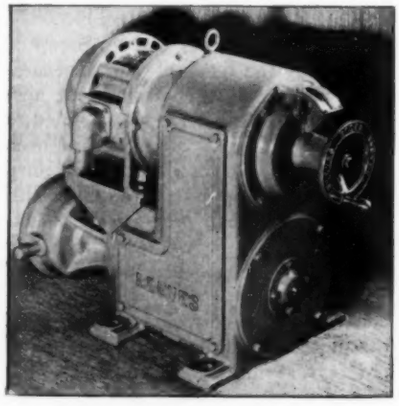


*Four different types of surface and needle pyrometers are secured by interchanging various types of thermocouples*

## Reeves Variable-Speed "Motodrive"

A variable-speed drive combining in a compact, self-contained housing any standard make of constant-speed motor, a variable-speed control, and, where required, speed reduction gears, has been developed by the Reeves Pulley Co., Columbus, Ind. Any make of foot-type, constant-speed motor of standard NEMA dimensions, may be used. Speed variations provided by this "Motodrive" are infinite between predetermined limits. By turning a handwheel, any desired speed within the range may be obtained. A dial indicator registers speeds on a scale calibrated from 1 to 6.

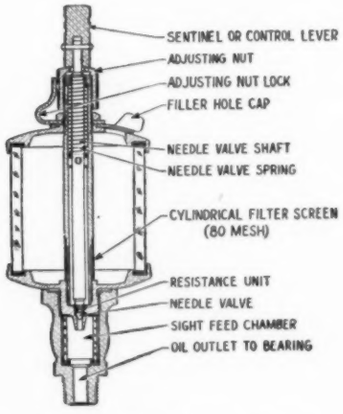
The "Motodrive" uses the principle of a V-belt running between two sets of cone-faced disks, which are adjustable in diameter and mounted on parallel shafts. The drive is ventilated, and has positive lubrication with forced-feed fittings. The variable-speed shaft may be extended on either side of the unit, as required. The "Motodrive" is made in horizontal and vertical types, with four sizes of each to take motors from ¼ to 7½ hp., covering speed ratios from 2 to 1, through 6 to 1. Helical-gear reduction units in ratios up to and including 189 to 1 may be incorporated in the drive.



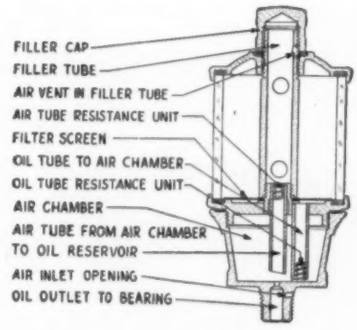
## Alemite "Thermatic" and "Microflow" Oil Cups

Alemite has expanded its line to include oiling devices, this division of Stewart-Warner Corp., 1826 Diversey Parkway, Chicago, Ill., announced. Two types of oil cups have been put on the market. The Alemite "Thermatic" oil cup gives a constant, slow flow of oil and affords reliable and economical bearing protection. It only requires filling, and operates by air expansion due to the normal temperature increase in running bearing. A rise of 1.8 F. starts a slow flow of oil. Daily fluctuation of room temperatures keep bearings of idle machinery lubricated with no danger of overflow. There are no moving parts in the cup. An 80-mesh filter screen at the bottom of the reservoir filters out foreign matter.

The "Microflow" cup is adapted to bearings which require a continuous flow of oil in small, adjustable quantities. It is fitted with a resistance unit, which permits a fine adjustment of oil flow and assures positive operation by preventing clogging. The larger opening in the discharge valve assures an unhampered flow of filtered oil. A grooved cylindrical plug, through which the oil must pass to reach the valve, can be adjusted to such a degree that the flow of oil can be made extremely minute.




*Alemite "Microflow" Oil Cup*




*Alemite "Thermatic" Oil Cup*

## Houghton's Soluble Grinding Oil and Paste

Especially developed to be used with the latest type of high-production precision grinding machinery, E. F. Houghton & Co., 240 West Somerset St., Philadelphia, Pa., has put on the market a soluble grinding oil and a grinding paste.

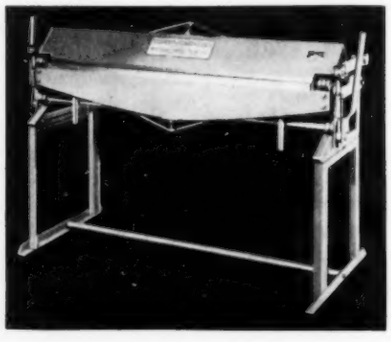
Houghton's soluble grinding oil protects and cools both work and wheel. The rapid release of abrasives and metal from the solution improves finish and reduces spoilage resulting from glazed or "loaded" wheels. Penetration properties and wetting-out qualities have been increased, which allow the solution to be carried to the point where the work is being done. The Houghton concentrates contain a rust-inhibiting agent, thus protecting both the grinding machine and ferrous parts against rust. A thin oil film remains on parts after the water has evaporated. The solution does not foam or form scum. It is so compounded as to be antiseptic and sterile.

Houghton's grinding paste is comparatively readily soluble in water. Mixing in hot water produces the best results. When mixed, this paste produces a low-surface-tension solution and also promotes more rapid radiation. It wets out rapidly, and readily reaches the point where work is being done. It has rust-inhibiting characteristics. It does not gum on the working parts.

## Whitney Sheet Metal Bending Brake

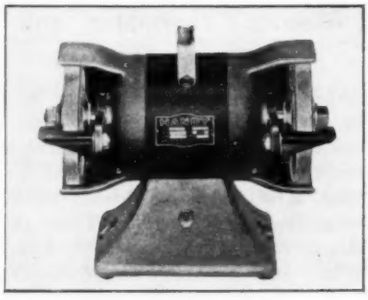
A light bending brake, has been announced by the Whitney Metal Tool Co., 110 Forbes St., Rockford, Ill. This brake is 4 ft. 1 in. long and weighs only 265 lb., making it possible for two men to carry it from job to job. Its capacity is 20 gage commercial iron used in air conditioning work.

Turnbuckle adjustments are used for rapid adjusting for various thickness of material, and a graduated scale at the hinge lugs is provided for duplicating work. The upper jaw is of box type welded construction. The lower jaw has welded reinforcements with a 1 in. projection for offset work of structural shapes. The bending leaf has angle iron welded underneath, crotchwise. The three members are provided with truss rods for further adjustments. This brake can be had in floor or bench styles.



## "Handy" 6-In. Grinder With ¼-Hp. Motor

A 6-in. ball-bearing grinder, powered with a ¼-hp. totally inclosed motor of the capacitor type, has been announced by the Baldor Electric Co., 4357 Duncan Ave., St. Louis, Mo. The motor works at 3,450 r.p.m., and has no commutator, brushes or centrifugal switch. The grinder is mounted in ball bearings, sealed against dust and requiring oiling only once a year. Wheels extend beyond the motor frame, permitting grinding of long pieces of material. Toolrests are adjustable upwards, downwards, in and out, and may be set at angles. A fine and a coarse wheel are furnished. The base and wheel guard are of cast iron, and the grinder has rubber feet which make bolting down unnecessary for light work. Shipping weight, 43 lb.



## Cleveland Socket Wrench Holder

The Cleveland Universal Jig Co., 13328 St. Clair Ave., Cleveland, Ohio, has developed a socket wrench holder of molded rubber composition base with a separate receptacle for each wrench. These bases are made in two sizes. The larger size accommodates eleven wrenches from $\frac{3}{32}$ to $\frac{5}{8}$ in. across the flats and is designed for general machine shop use, especially on repair and assembly operations. The smallest set, designed for toolmaker's use, accommodated eight wrenches ranging in size from $\frac{3}{32}$ to $\frac{5}{8}$ in. across the flats.

The design of the base is such that the wrenches locate at a slight angle so they will always remain in place, but at the same time the size desired is picked out instantly.

## "Armco H.T.—50" Steel

"Armco H. T.—50," a high-tensile steel, has been developed by the American Rolling Mill Co., Middletown, Ohio. The impact tensile strength is 5,000 ft.-lb. per sq.in., nearly double that of mild steel. Care has been taken to avoid strength in excess of actual requirements, to permit advanced fabrication and welding methods. The steel has a sufficiently high yield point to be used on jobs with the highest practical stresses, but maintains sufficient ductility to be adaptable for varied fabrication. The endurance limit of Armco H.T.—50 is 48,000 lb. per sq.in., but the yield point is 47,000 lb. per sq.in. in the hot-rolled grades. Few materials, the company points out, offer an endurance limit equal to, or greater than, the yield point. Tensile strength is 67,000 lb. per sq.in. in the hot-rolled grades and 70,000 in cold-rolled. Elongation in 2 in. is 28 per cent in hot-rolled sheets.

Because welding is now an accepted method in the assembly of structures that will be moved continually at high or low speeds, the carbon is confined to a low percentage. Strength has been obtained by other additions. Finished welds closely approach the unwelded parts in physical properties. Sheets and plates can be welded with many varieties of the so-called "shielded-arc" electrodes.

Atmospheric corrosion resistance of the metal is four to six times that of ordinary steel. Sheets and plates are offered in 20-gage and heavier.

# The Round Table

## MANICURING MACHINES

"Who's the elderly gent out in the shop, Al? Looks like a cross between a professor and a toolmaker."

"Well, you're half right, anyhow, Ed. He's a toolmaker—or was before the combination of age and depression got him."

"What's the idea? Are you making this a home for 'has-beens' or incurable mechanics?"

"Not exactly, Ed. I'm trying another experiment."

"Might as well save me asking any more questions, Al. What's it all about?"

"Well, Ed, I'm a bit fussy about having the machines kept looking well. I don't like to see lathes and other machines with chips all over them or with oil stains on the paint."

"Why not let the men who run them clean them? That's the way we do."

"I know it, Ed. Most shops do, but I'm not sure it's the best way."

"Why not? We knock off a half hour early on Friday and all hands clean up their machines ready for Monday morning."

"That's the usual way, Ed. But it has several objections. First of all, you lose a half hour's production on every machine. Next you'll find that some men, even good mechanics, don't like to clean machinery. They give it a 'lick and a promise,' without doing a good job of cleaning."

"What's so fussy about cleaning a machine, anyhow? All you need to do is get the chips off."

"They need more than getting off chips that can be seen a few feet away. On many machines small chips have a way of working into slides and bearings unless they are thoroughly cleaned out. Then, too, the machines get grimy with oil and dust from the shop itself. Kerosene helps a lot, and a little care in this work pays."

"And so you put the 'professor' on the payroll to do the artistic cleaning. Why not a husky laborer, if you must have a special man? Wouldn't that be cheaper?"

"In wages perhaps but not in results. The 'professor,' as you call him, loves machinery. He knows how it is made and how it should be cared for. Your laborer might get it clean by scouring the ways with abrasive cloth or even scraping off any grease with the end of a file. My man would know that would soon affect the alignment; he

knows how to care for machines, as well as you or I."

"But how can one man clean them all on Friday afternoon without interfering with production?"

"He can't, and he doesn't. He comes in about 4 o'clock every afternoon. Any machine that is idle he looks after at once. When the men quit he tackles one machine after another, keeping track of them so they all get a good cleaning once a week."

"What about work on the machine?"

"That's another advantage of a skilled man. He never disturbs a setting on a machine. If he can't do a thorough cleaning job, he does it later."

**Is Al's idea of employing a skilled cleaner sound? Or should each man clean his own machine?**

## DISCUSSION

### Gaging Gages

By all means Al should send his gages regularly to some laboratory of recognized standing for checking. It would be foolish for a small shop to install expensive testing equipment, and an outside check has the advantage of being entirely uninfluenced by any desire to save or favor expensive tools. Their only interest is to determine the correct value of the gage.

Recently I inspected some mirrors for precision instruments, using a pet optical flat. I noticed that each mirror was apparently curved, although made by a reputable manufacturer. A trial of my flat by the Bureau of Standards disclosed that it, not the mirrors, was in error, the glass having warped. This condition was entirely unsuspected. If only one individual mirror had been under consideration, it would undoubtedly have been rejected as not having the required flatness, whereas the gage, not the part, was actually what was incorrect.

—D. L. Parkhurst,
*Chief, Instrument Division,*
*U. S. Coast & Geodetic Survey.*

### New Tricks

There have been so many responses regarding the discussions between Al and Ed that I am taking the liberty of deviating from the usual procedure of politely agreeing with Al.

Since Al is responsible for the net results of his new foreman's methods, he must also be responsible for his appointment, so let's give the new foreman a rest and slap Al for a change.

Where did the new foreman come from? Why was Al so stupid as to hire him without knowing something about his technical training, his practical education and his ability to handle men? What does Al know about the new man's ability to assume a foreman's responsibilities? How much knowledge has this foreman of the prevailing methods, customs, equipment and tooling in Al's shop? Even though the foreman is new on the job, Al should not be in his present muddled state of mind, as he is only advertising to the world at large that he is not sufficiently familiar with his own shop routine to enable him to form a clear and concise mental decision of right from wrong. If Al, the "super," who has all the facts is in a fog, how can we without facts give an intelligent solution? However, I move that we fire Al and get an alert "super" who knows how to pick and handle foremen. —A. W. Lovell.

### Going to Townsend

As a regular reader—and an appreciative one—I was dismayed and disappointed that any person with the status of Ed. could make such ignorant remarks about the Townsend plan. His figures have so often been refuted only one of two things is possible: Either he does not understand it or he deliberately falsified. The transaction tax is NOT based on a national income of 49 billion, but on national transactions of 500 billion. Two per cent of this will pay for the plan and leave a large balance to pay off the national debt. It did not bankrupt the country to fight the War, which cost more than the plan will. So let us try it out, and if it is no good not even the Townsendites will want to keep it. We can repeal the law in short order; if it proves to be a good thing we will all want to keep it.

—Walter Cecil Cox.

### Purchased Parts

In farming out work, if Al will specify the tolerances on all dimensions according to interchangeable requirements and will provide penalties for late deliveries, the questions of workmanship and availability should be covered. If special steel, or castings of special iron content or density of grain are essential, it would seem advisable to furnish such materials to the contract shop and to provide penalties for spoilage.

To start with, it would be advisable to select a number of the most promising shops and let contracts to them in excess of needs as a sort of insurance against being caught with a shortage that might cause a loss of business. One or two of the best shops may, in time, be given all the outside work. However, trial contracts should be let occasionally to one of the other shops as a general check-up.

Al should go over the design of his compressor carefully, and if possible redesign it to use as many purchaseable standard items as practicable. If business continues to improve, it will then be time enough to consider enlarging the plant. —J. C. P. Bode.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### Concrete Floors

Though concrete floors cause coldness of the feet in a shop that is inadequately heated, that is not the only reason why they are disliked. Their hardness, too, is only thought of by the machinists where the chips and turnings produce disastrous effects on the soles of their shoes. It is not uncommon under such conditions for the average life of shoe soles to be about three weeks.

A further disadvantage of concrete floors (especially when the cement has not been properly mixed) is the tendency to cause dust, and I have known men coming out of a shop having concrete floors looking more like flour millers than machinists. It goes without saying that such a conition is not beneficial to the machinery.

When grease or oil is spilled on concrete floors and around the machines, which cannot always be avoided, the surface becomes smooth and slippery and is positively dangerous. Wood, either boards or blocks, has proved from long experience to be the best material for machine shop floors and, paradoxical as it may seem, lasts longer than concrete. —R. G. Hewitt,
*Huddersfield, England.*

### Open House

Order and system are essential to successful management. Any system wherein the workers are depended upon for the care and control of company tools will result in loss to the company in a proportion dependent upon the extent of such trust. Since every shop has some men who are likely to disregard such trust as may be placed in them, it is essential that steps be taken to assure a complete record.

For the best results, a toolcrib should be installed in every machine shop, irrespective of size or type. Each tool and each class of tools should be catalogued and maintained in good working condition, including sharpening and all necessary repairs. Means should be provided for issuing tools and for insuring their return. The toolcrib should have a special place for each tool, easily accessible and marked; a means for determining who has borrowed certain tools; and a record of their condition.

The cost of maintaining a systematic toolcrib, including the wages of an attendant, will be more than amply covered by the savings resulting from increased tool life; time saved in locating tools; and the knowledge of what tools are available. Neatness and systematic control will instill a respect for care and precision among the workers, which in themselves are of inestimable value to any progressive concern.

—Joseph Waitkus,
*Engineer, The Preheater Corporation.*

### Home Talent

Al is following logical and business like methods in sending his heat-treating work to a specialist.

Playing around a forge or with an acetylene flame to harden and draw special steels is one of the surest ways to learn that the specialist who has modern heat-treating equipment can save you money.

The wise shop executive has a man who can pinch hit in an emergency and do a tolerable job of hardening and drawing with the available shop facilities, but when he has time to get the job done right, he sends it to a specialist who has the proper equipment. The result is that he gets uniformly good work at uniform costs.

—E. E. Gagnon.


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# TRADE PUBLICATIONS

BEARINGS. A 40-p. catalog, No. 1520, has been published by Link-Belt Co., 307 North Michigan Ave., Chicago, Ill., on the company's complete line of anti-friction bearing units. These include pillow-block, hanger, takeup, flanged, duplex and special mountings.

BEARINGS. The Timken Roller Bearing Co., Canton, Ohio, has issued an enlarged edition of the mine car and mine locomotive section of their Engineering Journal. It contains a complete listing, with mounting diagrams and tabular data from which bearing sizes may be selected for any loading, for all types and classifications of mine cars ranging in capacity from 1½ to 35 tons.

DIE-MAKING. A 24-page booklet describing "Cerromatrix," a material and a method for reducing the cost and time involved in die making, has been issued by Cerro de Pasco Copper Corp., 44 Wall St., New York, N. Y. The material is an alloy of bismuth, lead, tin and antimony used for mounting dies and punches.

FLASH WELDING. A folder describing Model "F-7" flash welder, developed by Thomson-Gibb Electric Welding Co., Lynn, Mass., discusses welding pressure devices, and serves as a guide to the various methods in applying welding pressure.

FOUNDRY PRODUCTS. The American Brake Shoe and Foundry Co., 230 Park Ave., New York, N. Y., has issued Bulletin No. 36, outlining the products of subsidiary and associated companies.

GAS CUTTING. General Welding & Equipment Co., 28 Carleton St., Cambridge, Mass., has issued a catalog of its Type "K" stationary automatic shape cutting machines.

GEARS AND REDUCERS. The Ohio Gear Co., 1333 East 179th St., Cleveland, Ohio, has issued a catalog on spur gears, bevel and miter gears, worms and worm wheels, couplings, pulleys, shafts, cams, clutches, reducers, and sprockets and chains. The catalog contains an 18-page section of tables for ready reference.

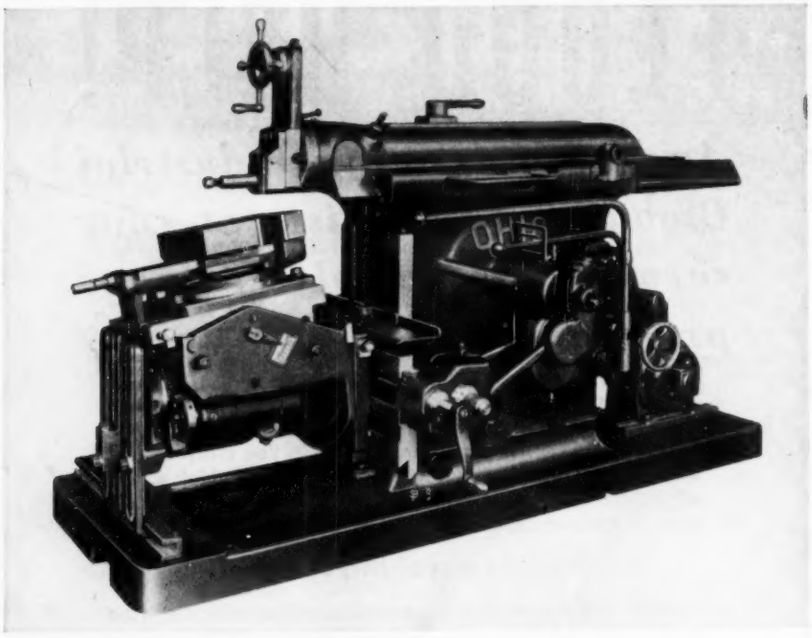
GEAR STOCK. Spaulding Fibre Co. Inc., 484 Broome St., New York, N. Y., has issued page 13 of the Spaulding Engineering Data Book.

ELECTRICAL MACHINERY. New and revised requirements for most of the rotating electrical machinery manufactured and used in the United States are now made available in a single volume, the "American Standards for Rotating Electrical Machinery," recently published by the American Standards Association, 29 West 39th St., New York, N. Y. Standard requirements and specifications for electrical machinery from the large central station generators and industrial and steel-mill motors to the small motors used on machine tools, industrial and household appliances, are included in the publication.

INDUSTRIAL TRUCKS. A folder on industrial wagon trucks, for handling hot or cold iron and steel products inside the plant, has just been issued by Lewis-Shepard Co., Watertown, Mass.

PLASTICS. A folder issued by the Plaskon Co., Inc., Toledo, Ohio, shows some of the newer products manufactured by several companies from Plaskon. It is Bulletin No. 5.


"OHIO" SHAPERS



UNIVERSAL SHAPER

Table revolves to any angle up to 360 degrees on large trunnion cast integral with saddle, by a self-locking worm and worm wheel. Tilting top adjustable 15 degrees either way from horizontal, equipped with direct reading dials. Solid top and tilting top have three tee slots.

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Complete feed and power rapid traverse control located on end of rail.

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